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THESIS

B

DESIGN AND IMPLEMENTATION OF A DENTAL
INFORMATION RETRIEVAL SYSTEM (DIRS)

by

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and

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NAVDENCLINIC Long Beach, Ca., is the sponsoring activity for the DIRS, and will serve as the test site for system implementation. If the system is successful, Director of Dental Services, San Diego, Ca., has indicated interest in the system as a Navy-wide managerial tool.

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Design and Implementation of a
Dental Information Retrieval System (DIRS)

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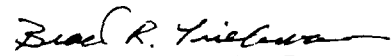
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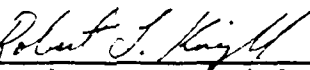
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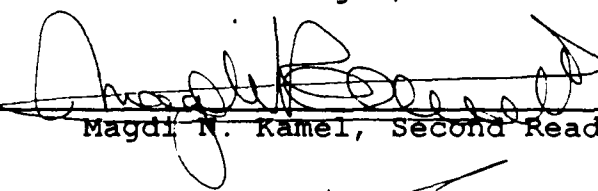
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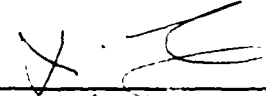

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ABSTRACT

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This thesis develops a computerized database system providing increased accuracy and productivity, and capable of meeting the NAVMED reporting requirements. The Dental Information Retrieval System (DIRS) developed will record all treatments provided for each beneficiary category described in NAVMEDCOMINST 6600.1B, and will facilitate internal and external daily, weekly, monthly and annual reporting requirements. An important design consideration is providing the DIRS developed with the requisite capabilities specified by the DTF's, without imposing additional hardware requirements.

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A-1



TABLE OF CONTENTS

| | | |
|------|--|----|
| I. | INTRODUCTION ----- | 1 |
| | A. BACKGROUND ----- | 1 |
| | B. STATEMENT OF PROBLEM ----- | 4 |
| | C. SCOPE ----- | 6 |
| | D. METHODOLOGY ----- | 7 |
| | E. FEASIBILITY ----- | 8 |
| II. | USER REQUIREMENTS ----- | 10 |
| | A. PRESENT SYSTEM ----- | 10 |
| | B. REQUIREMENTS DEFINITION ----- | 14 |
| III. | SYSTEM DESIGN ----- | 27 |
| | A. LOGICAL DATABASE DESIGN ----- | 27 |
| | B. APPLICATION DESIGN ----- | 36 |
| | C. MENU HIERARCHY DESCRIPTIONS ----- | 39 |
| IV. | SYSTEM IMPLEMENTATION ----- | 56 |
| | A. INTRODUCTION ----- | 56 |
| | B. dBASE III PLUS ----- | 58 |
| | C. SOFTWARE DOCUMENTATION ----- | 61 |
| | D. REPORTS ----- | 61 |
| V. | CONCLUSIONS AND RECOMMENDATIONS ----- | 63 |
| | A. SUMMARY AND CONCLUSIONS ----- | 63 |
| | B. RECOMMENDATIONS AND FUTURE WORK ----- | 65 |
| | APPENDIX A: OBJECT DIAGRAMS ----- | 66 |
| | APPENDIX B: OBJECT DEFINITIONS ----- | 68 |

| | |
|---|-----|
| APPENDIX C: DOMAIN DEFINITIONS ----- | 71 |
| APPENDIX D: DATA FLOW DIAGRAM ----- | 76 |
| APPENDIX E: UPDATE, DISPLAY AND CONTROL MECHANISMS --- | 79 |
| APPENDIX F: RELATION DIAGRAM ----- | 98 |
| APPENDIX G: LOGICAL MENU STRUCTURE ----- | 99 |
| APPENDIX H: SAMPLE REPORTS ----- | 100 |
| APPENDIX I: NAVMED FORM 6600/11 ----- | 108 |
| APPENDIX J: NAVMED FORM 6600/8 ----- | 111 |
| APPENDIX K: DENTAL INFORMATION RETRIEVAL SYSTEM (DIRS) USER'S MANUAL ----- | 113 |
| LIST OF REFERENCES ----- | 134 |
| INITIAL DISTRIBUTION LIST ----- | 135 |

I. INTRODUCTION

A. BACKGROUND

Naval Medical Command (NAVMEDCOM), Washington, D.C., is chartered to provide general and specialized health and dental care for active duty members of the Navy and Marine Corps at ships, posts, and stations worldwide. When available, this service extends to other eligible beneficiaries; members of other Federal Uniformed Services, retirees and their dependents, and dependents of active duty personnel.

To meet requirements for internal and external budgeting, performance, training and readiness reporting, NAVMEDCOM tasks all activities providing dental care to submit Dental Information Retrieval System (DIRS) reports as prescribed in NAVMEDCOMINST 6600.1B. This instruction provides guidance for submission of monthly reports from subordinate Dental Treatment Facilities (DTF) or Regional Headquarters to COMNAVMEDCOM in Washington D.C. Procedures for reporting dental readiness are explicitly specified in the instruction, including outlines of treatment codes and the associated composite time values required for producing mandated monthly reports used as input to the Medical Expense and Performance System (MEPRS). MEPRS is a Department of Defense (DOD) mandated report that is prepared at NAVMEDCOM from input

provided by subordinate medical and dental commands in the Department of the Navy (DON).

Commanding officers and heads of dental departments at all activities providing dental care are responsible for submission of NAVMED 6600/8, the DIRS monthly Treatment Report. If personnel from more than one DTF are combined under a single command, then the senior dental officer at the headquarters level is responsible for compliance with the NAVMEDCOMINST directives and for the accurate treatment totals assigned to the corresponding provider.

The preface to NAVMEDCOMINST 6600.1B states:

The (COMNAVMEDCOM) DIRS is a computer-based collection and information processing system designed to collect data on the treatment provided to all eligible beneficiaries. The information provided by the DIRS will assist Dental Corps managers at all levels in accomplishing accurate and realistic planning for resource requirements, allocation, and use. [Ref. 1]

Submission of the NAVMED 6600/8 and other dental reports follow the dental command hierarchy depicted in Figure 1.1.

At NAVMEDCOM level, the DIRS is a computer-based system. However, the DIRS Treatment Report (NAVMED 6600/8), the requisite monthly feeder report from all DTF's, is a ten-pitch optical character recognition (OCR) form that presently may only be prepared manually. It is this mandated submission format and data collection requirement that has created a need for the development of computerized DIRS at the lower echelon DTF's. Although some commands have proceeded with in-house development of automated DIRS, none have been successful in

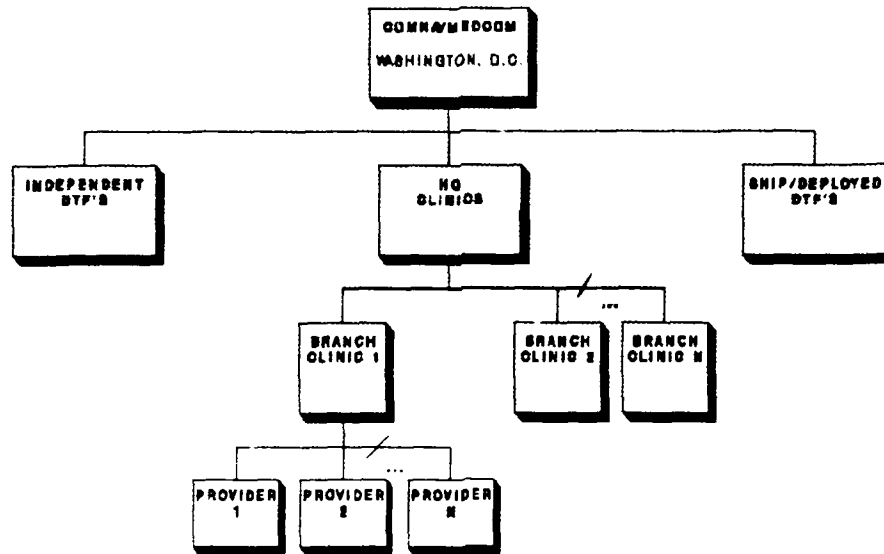


Figure 1.1 Organization Chart

providing adequately for data integrity issues such as redundancy, consistency and concurrency. Most systems were created by non-ADP personnel with little or no formal training in database design issues, hence much of the desired functionality, especially in the areas of updates to the database and supporting documentation, were inadequately addressed or exhibited poor design.

The mandated monthly NAVMED 6600/8 report resulting from either a manual or computerized DIRS is transcribed via OCR-A capable typewriter, and the resulting original form is mailed to COMNAV MEDCOM. Reports submitted for a given month are to

be received no later than the 15th day of the following month. At NAVMEDCOM in Washington, D.C., these reports are entered into the DIRS via OCR reader. Any failure in the ability of the OCR reader to assimilate the correct data, caused by ordinary and extraordinary events such as folds, staple holes, stains, rips, ink too light, misaligned characters, etc., requires report resubmission by the corresponding DTF. The weakness of such a system is obvious, and represents a major bottleneck to the efficiency and success of the reporting system.

B. STATEMENT OF PROBLEM

The problem with DIRS is twofold: The first problem is that manual systems require assignment of a significant collateral duty to a dental technician (DT) to gather, sort, compute and report dental treatment information submitted by each provider. Each individual treatment is assigned a composite time or weighted point value. The time savings offered by an automated system, would allow better use of the DT assigned to this task in more critical duties related to actual patient care. The second problem is that existing computerized DIRS applications are command dependent; lacking standardization in quality and capabilities and tailored only for a specific command. The present computerized DIRS application is also dependent on a particular database package. For example, any update function must be achieved via the specific DBMS used to develop the application program.

This dependency is costly in the sense that given a DIRS system programmed using a commercial database package such as ORACLE or INGRES, that specific package must first be installed on the personal computer (PC) used for DIRS reporting. The personnel operating such a system must be familiar with the nuances and features of the particular database package, which complicates the training on the system.

A solution to these problems was hoped to be found in the Dental Management Information System (DENMIS), a proposed tri-service system, which had its first module (patient appointment module) tested last year at Headquarters NDC Long Beach, Ca., with unsatisfactory results.

Further development effort on the DENMIS and on individual modules such as DIRS was halted with the original contractor. The DENMIS contract was relet through NARDAC, Washington, D.C., with proposed testing at 27 sites in 1990. According to the contract firm, the proposed DENMIS will require an 80386-based personal computer to function properly. This particular specification tends to limit the utility of the program developed, for some Dental Treatment Facilities, especially small or deployed DTF's currently lack this additional specified hardware requirement. Recent information indicates that the contracted DENMIS system will not include a DIRS module as a result of insufficient funding. [Ref. 2] The current thesis work is not intended to replace DENMIS, but

to provide a quality DIRS module for NAVDENCLINIC Long Beach, Ca., and the Director of Dental Services, San Diego, Ca., until possible future delivery of a contractor-developed DIRS.

The identified requirement for a computerized DIRS coupled with the uncertain future of DENMIS, have generated renewed interest in the development of a proposed flexible PC-based DIRS system that will aid lower echelon DTF's in meeting the stringent reporting requirements mandated by COMNAVMEDCOM.

C. SCOPE

The proposed Dental Information Retrieval System (DIRS) is intended to provide a stand-alone, compiled, non-command dependent relational database system and associated applications program. The system is necessary to support administration, documentation and accounting of patient treatment provided by dental officers and dental laboratory technicians. The software system development life cycle (SDLC) will be used to develop a working DIRS (to include: system analysis, design, development, documentation in the form of user's manual, implementation and training). Research issues are listed below:

- Identification of user requirements.
- Examine present instructions or guidelines for DIRS.
- Determine if it is feasible to develop a DIRS's system that is not dependent on an external DBMS; i.e., dBASE IV, dBASE III PLUS, ORACLE or any other off-the-shelf DBMS.

- Determine if a DIRS's system can be developed that is command independent, i.e., Unit Identification and/or provider(s) code not hardcoded in source code.
- Develop a system to support multiple clinics, yet account for each DTF separately.
- Execute critical file back-up without requiring access to an external DBMS.
- Organize, sort, and index files without access to an external DBMS.

The goal of this development effort is an imbedded DBMS in the compiled DIRS application that can be used on any IBM PC compatible system with a minimum 20 megabyte hard disk commonly found throughout the U.S. Navy dental community. Success with this project would reduce unnecessary off-the-shelf database purchases, reduce many long hours of manual data collection and manipulation to produce mandated reports. Automation will improve accountability of dental productivity, and will provide better utilization of dental personnel.

D. METHODOLOGY

Prior to development of a computerized DIRS, the current system must be analyzed and the needs of system users identified. A four-phase process of system analysis will be followed: study, requirements definition, design and implementation phase.

In the study phase, the relative characteristics, capabilities and deficiencies of the current system are examined and documented.

Specific objectives in gaining a thorough understanding of the system are:

- Identify system users and others affected by the current system.
- Identify deviations and deficiencies between goals, purpose, policies and objectives of the present system, and actual system performance.
- Identify functions of the current system that provide adequate support to the mission and users.
- Map the components of the present system, and analyze the required interaction.

In requirements definition, the second phase of systems analysis, the following two goals were identified:

- Identification of required objects and their structure.
- Identification of functional components for each application with access to the database.

In design phase, the third phase of systems analysis, the specific actions listed below must occur:

- Transformation of objects into a relational design.
- Developing the functional requirements into application design. This includes detailed formats for forms, reports, menus, and logic for programs.

Implementation is the actual transformation of relations, and pseudo-code developed during design phase into files and working applications. In this phase, actual coding, testing, installation, and training of users will occur.

E. FEASIBILITY

1. Cost

The developmental cost of the Dental Information Retrieval System is limited to the personal time and effort of

the thesis participants. Equipment needed for system development is now on hand either at the Naval Postgraduate school, Monterey, Ca., or in the personal possession of the thesis team. Implementation and training at the test site is not expected to exceed two working days. The sponsoring activity; Headquarters Naval Dental Center (NDC), Long Beach, Ca., has offered financial support for the travel, implementation, and training costs associated with this project. Extensive use of pull-down menus, simple easy-to-follow dialogue, and a comprehensive DIRS user's manual will simplify training.

2. Technical

The design architecture proposed will allow the individual DTF to store one year of provider's treatment information for the entire command, on the DIRS. The minimum hardware requirement is stated below:

- An IBM-AT compatible computer with a minimum 640K RAM memory.
- 20 megabyte capacity hard disk.
- MS-DOS version 3.0 or later release.
- An OCR 10 pitch printer.

3. Schedule

The proposed system will be available as a complete working application including documentation, by March of 1990. It should be possible to develop and test DIRS in one to two months. Installation and user training is not expected to exceed two to three days.

II. USER REQUIREMENTS

A. PRESENT SYSTEM

Each dental command has a DIRS to meet reporting requirements mandated by COMNAVMEDCOM. The monthly submission by fleet DTF's of the NAVMED 6600/8 (DIRS Treatment Report), is the culmination of a daily manual collection and categorization effort by each provider and supporting DT at each DTF.

As depicted in Figure 2.1, data origination occurs as a dental provider (dentist, dental technician, etc.), performs a treatment or multiple treatments on a patient belonging to one of nine beneficiary category codes (see Figure 2.2). Each provider in a DTF will record this information for every patient attended during the reporting period (in this example, a single day) on a Daily Count Sheet. The dental technician assigned responsibility for aggregating this data insures a corresponding three-digit provider code is assigned to the respective provider treatment counts prior to producing a daily NAVMED 6600/11 (Appendix I). Each day treatments are performed requires a NAVMED 6600/11 for inclusion in the monthly summation of provider totals; NAVMED 6600/8 (Appendix J). It is this report that must be prepared in OCR format for eventual submission to COMNAVMEDCOM, Washington, D.C., after routing through the respective chain of command. Branch

clinics operating under a headquarter's clinic are required to submit their data for inclusion in an aggregate headquarters NAVMED 6600/8 report. Independent DTFs submit their report

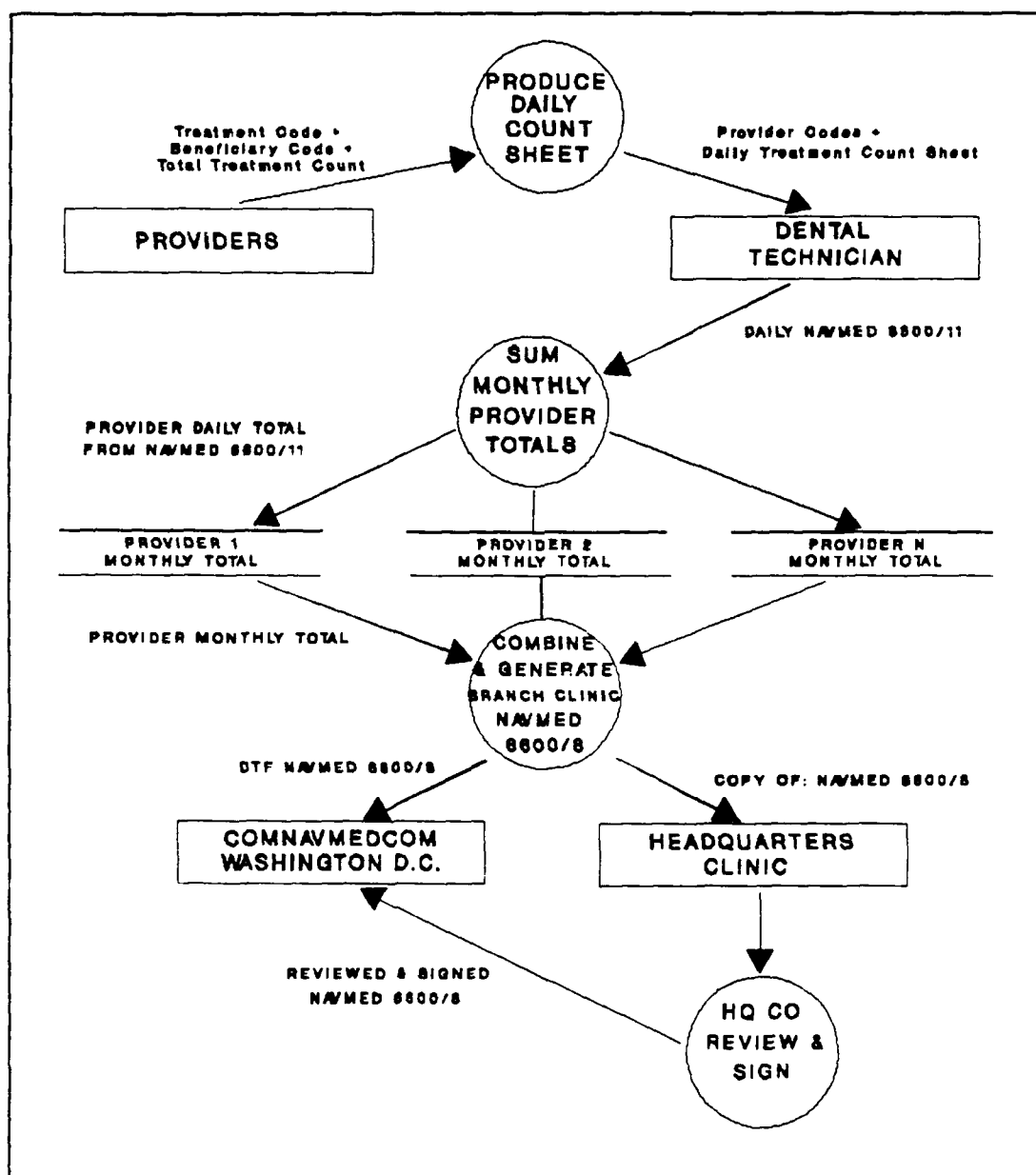


Figure 2.1 Current Manual DIRS Data Flow

directly to COMNAVMEDCOM. In both cases, report receipt in Washington D.C. is required no later than 15 days following conclusion of the reporting period. User interviews indicate that report preparation may require several days, especially at headquarters commands. Reports must be tabulated by individual provider, beneficiary category codes, and coded treatments completed. Each beneficiary code listed in Figure 2.2 must have individual accounting of treatments performed, for each provider assigned to a DTF.

| BENEFICIARY CODES: | |
|--|--|
| 01 - Active Duty, U.S. Navy | |
| 02 - Active Duty, U.S. Marine Corps | |
| 05 - Active Duty, Other Services | |
| 08 - Recruit, U.S. Navy or Marine Corps | |
| 09 - Dependents of Active Duty | |
| U.S. Uniformed Services Personnel | |
| 10 - Dependents of Retired or Deceased | |
| U.S. Uniformed Services Personnel | |
| 11 - Retired Uniformed Services Personnel | |
| 12 - Other Personnel not listed in Codes | |
| 01 through 11 and 13 | |
| 13 - Dependent Children, | |
| (17 & under and unmarried) | |

Figure 2.2 Beneficiary Code Table

Reporting preparation difficulties are compounded by the vast number of most frequently performed clinical services

treatment codes (over 280), and over 82 laboratory services codes. "The clinical services treatment code weight factors are based on time values and are termed composite time values (CTV). A CTV of 1 equals 17 minutes." [Ref. 1] Similarly, each laboratory services code is assigned a composite lab value (CLV). One CLV is assigned a six minute value. A wide variance in possible point value complicates reporting; in clinical services, for example, blood pressure recording is assigned a CTV of .3, while fitting for a partial denture with precision attachments is assessed a 25.9 CTV. For lab services the variance is greater; from 1 CLV for issuing teeth, to an assigned CLV of 220 for creation of an Andrews Bridge (an entire dental restoration). This information is valuable as a management tool for examination of historical trends, administration and resource allocation decisions, and in comparison/analysis of various ratios; i.e., total CTV's divided by number of providers, CLV's by available time, etc.

The submission to COMNAVMEDCOM in the form of NAVMED 6600/8 is a monthly compilation of Daily Treatment Records from all providers at a given DTF. The Unit Identification Code (UIC) identifies the activity submitting the report. NAVMEDCOMINST 6600.1B states that each Dental Treatment Facility must submit the OCR format NAVMED 6600/8 via priority mail to arrive at COMNAVMEDCOM "not later than the 15th day of the month following the month for which the treatment was provided." [Ref. 1] The instruction also directs that a copy

of the submission be mailed to the "appropriate geographic naval medical command (geographic NAVMEDCOM)." These mandated stipulations create time constraints that leave little or no time for the responsible headquarters command to review subordinate clinic's NAVMED 6600/8.

While the current technology exists within the DON to expedite reporting system requirements, the rigid adherence to the OCR-A typewriter and carbonized form creates a reporting bottleneck causing needless delays and repetition. The time lost in preparing and submitting the NAVMED 6600/8 each month is valuable time that could be spent on patient care. The present system can support only one clinic and lacks the provision for data import to meet mandated reporting via their respective headquarters, in effect rendering each DTF an independent command.

B. REQUIREMENTS DEFINITION

The purpose of this phase is twofold. It defines data requirements (objects) that must be represented in the database and outlines functional requirements; (update, display, and control mechanisms) necessary to support the Dental Information Retrieval System. User requirements are the "blueprint" for database design. [Ref. 3] Accurate identification and representation of user requirements is critical to the success of the entire development effort.

An object-oriented methodology will be used to define and further clarify actual user requirements. This methodology

includes the identification of objects, development of object views, and materialization of these views into applications. "An object is a named collection of properties that sufficiently describes an entity in the user's work environment." An entity is "a class of things that exist in the users business environment." [Ref. 3]

1. Data Requirements

Objects necessary for inclusion in the database were identified by examining NAVMEDCOMINST 6600.1B, current manual DIRS data flow (Figure 2.1), and from personal interviews of dental technicians and dental managerial personnel. Through the processes described above, objects were identified and transformed into object diagrams (Appendix A).

a. Object Description

In defining the requirements of a database application, it is important to identify and capture those objects that accurately describe the aspects of the user's work environment which the database is intended to model. Recall that "an object is a structure that represents an entity." [Ref. 3] Multi-valued properties are allowed to have more than one value, and may themselves be objects or non-object properties. "Object properties represent other objects" while "non-object properties represent descriptive characteristics" of objects. User's environment objects and properties identified are described below. Depictions of objects are accomplished through the use of object diagrams

(see Appendix A.) "An object diagram describes objects in the user's world and their relationship to one another." The seven boxes depicted in Appendix A each represent a single object. Listings inside each box contain all properties of that object. Note that some properties listed are portrayed in lowercase letters, while others are enclosed in small boxes and are written in uppercase letters. These properties are themselves other objects. For example, the PROPERTY "COMMAND" inside the box titled "STATS (HQ)" denotes that the object COMMAND is a property of the object STATS (HQ). The subscript "MV" beneath some of these boxes denotes that the property is multi-valued.

The Provider Object represents individual personnel who provide direct and indirect patient care. A laboratory technician performing a procedure such as waxing a crown, is an example of indirect patient care. A dentist delivering the crown is an example of direct treatment. Individual rank, name, and duty status (active duty, reservist or contractor) are properties of this object. The multi-valued Daily object is also a property of the Provider object, relating the provider with the properties associated with the Daily object.

The Treatment (DIRS Code) Object represents treatment codes, the military services-developed series of codes adopted from the American Dental Association (ADA) Council on Dental Care Programs. Each treatment is assigned

a unique identifying code, description of treatment, and a composite time value (CTV). There are approximately 300 codes. Treatment codes are identified in full and can be found in NAVMEDCOMINST 6600.1B. The proposed DIRS will include the list of codes and their meaning, to eliminate the inconvenience of looking the information up in the NAVMEDCOMINST.

The **Command Object**, which consists of the Unit Identification Code (UIC), the command name, and the MEPRS codes, identifies the submitting unit. The MEPRS code is also known as the UCA code, and is used only for NAVMEDCOM Naval Hospitals and Naval Dental Commands. The four digit code for each work center is required on each NAVMED 6600/8 submission, and delineates the type and location of dental procedures performed. The Command object also includes the multi-valued, Provider and Year objects.

The **Daily Object** represents entries for a particular data entry session, that include each instance of an individual provider providing a treatment to a patient in one of the nine beneficiary categories. The NAVMEDCOMINST does not specify a requirement that daily treatment information be automated, but a hardcopy of the Daily treatment work sheets must be kept on-hand for two years.

In order to support both headquarters and branch clinics, three additional objects have been identified. The responsible headquarter's command has indicated the desire to

maintain a year's compilation of information on all its component commands. Each branch clinic must maintain data specific to their clinic for a year. Both commands want to store information for a period of one year, but neither command has large capacity ADP storage hardware. Both want the capability of retrieving data by month in the appropriate format stipulated in NAVMEDCOMINST 6600.1B. For these reasons, a Year Object, and Monthly Object are needed to track branch clinic information and a Stats (HQ) Object is needed to keep all statistical information on all its subordinate commands. A Unit Identification Code (UIC) entity is required to uniquely identify a specific DTF. The Year and Monthly objects are very similar in structure. Each object consists of information relevant to the treatment performed on a particular beneficiary category code, the provider performing treatment and provider status, and the calendar month the treatment was effected. Object definitions are provided in Appendix B.

b. Domain Definitions

In addition to identification of required objects, and user views of those objects, further clarification of user requirements is achieved through specification of domain definitions. A domain is defined as "a description of the allowed values of an attribute." [Ref. 3, p. 150] Domain definitions include both physical descriptions of allowable data values, and logical descriptions pertaining to attribute

meanings. The domain definitions specified are provided in Appendix C.

2. Functional Requirements

a. Data Flow Diagrams

Using the object requirements identified in the previous section, and proceeding with the object-oriented methodology, a dataflow diagram (see Figure 2.3 or Appendix D) was developed depicting required actions on objects identified.

A dataflow diagram portrays the business functions and their data interfaces. Dataflow diagrams can be used to identify applications and the data they use. Four symbols are used in a dataflow diagram. Internal system processes are shown in circles, while external processes are shown in rectangles. Data interfaces are illustrated with named arrows, and stored data, including the database, is shown between parallel horizontal lines. [Ref. 3]

As depicted in Figure 2.3, update mechanisms (add, edit and delete) and display mechanisms are required for DIRS and PROVIDER object. Daily transactions cannot be recorded unless valid DIRS or provider information is recorded in the database. This information is provided by either NAVMEDCOMINST 6600.1B or DTF managers. Both provider and DIRS treatment code are unique, only one provider may be assigned provider code 100 for example. For the same reason, only treatment code "0120" may represent a periodic oral examination. The proposed system shall provide update mechanisms insuring that duplicate records will not be created for those objects. Management assigns provider codes to new providers reporting onboard. To preserve data integrity, a

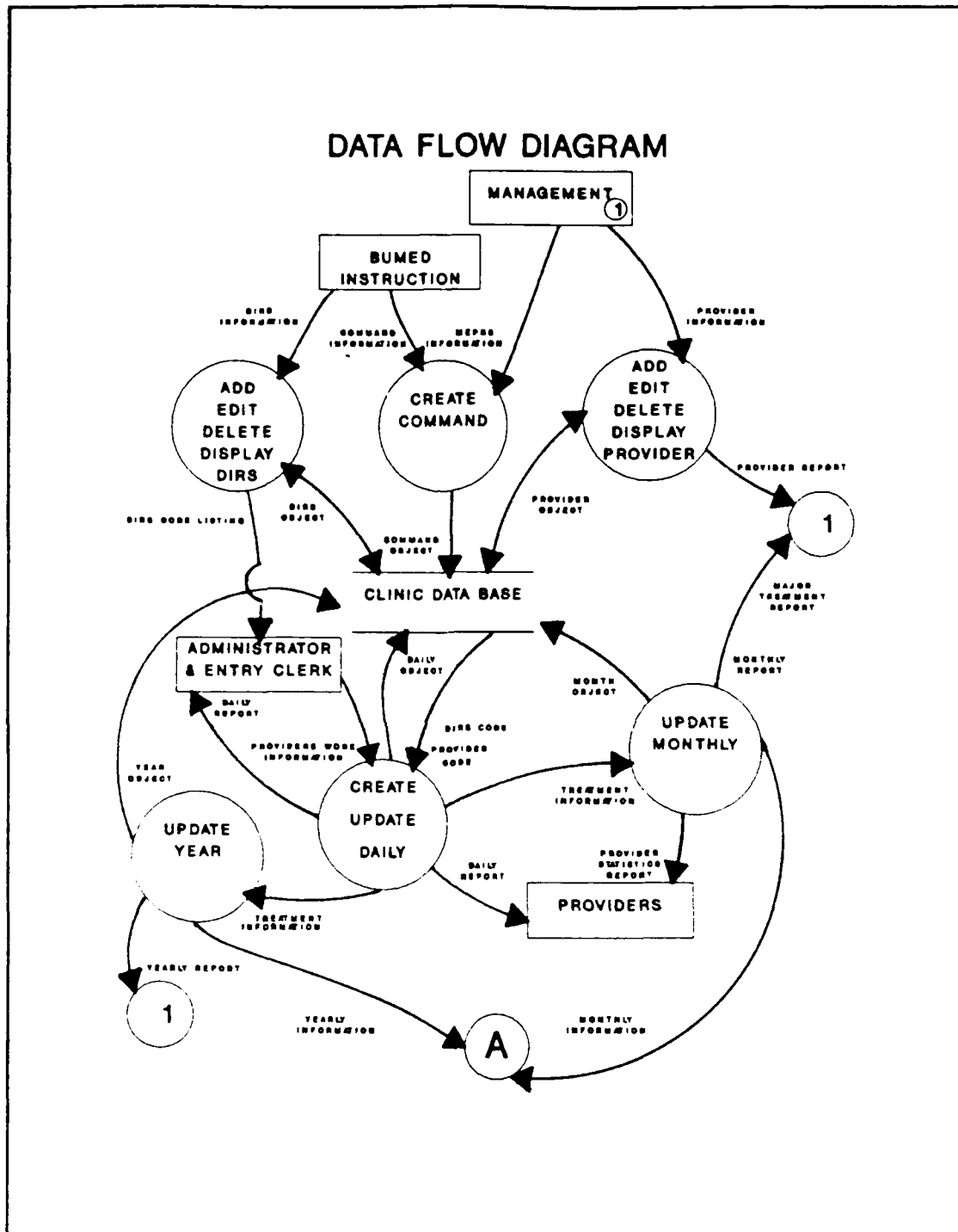


Figure 2.3 DIRS Data Flow

current provider listing will be generated for management review and to assist them in assigning provider codes to new personnel.

The **COMMAND** object will be created only once upon initial installation of the proposed system. Command and MEPRS information are derived from COMNAVMEDCOMINST 6600.1B and DTF management. This object itself serves as a control mechanism. Users will only be authorized to access commands specified in this object.

The heart of the required application is the creation and update mechanisms for the **DAILY** object. For it is through these mechanisms that the **MONTHLY** and **YEARLY** objects are updated. It will be the responsibility of the data administrator or data entry clerk to input provider work information which will update the **DAILY**, **MONTHLY**, and **YEARLY** objects. Appendix E delineates update, display and control mechanisms for each object described above.

A **STATS (HQ)** object is created and updated through monthly and yearly information submitted by subordinate commands. A headquarters database must be maintained for a minimum of one year, consisting of the aggregate provider production information for each subordinate command. This object will provide management with the central depository to meet internal and external reporting requirements. The dataflow diagram presented in Figure 2.4 represents these

actions. Appendix E delineates update, display and control mechanisms for the STATS (HQ) object.

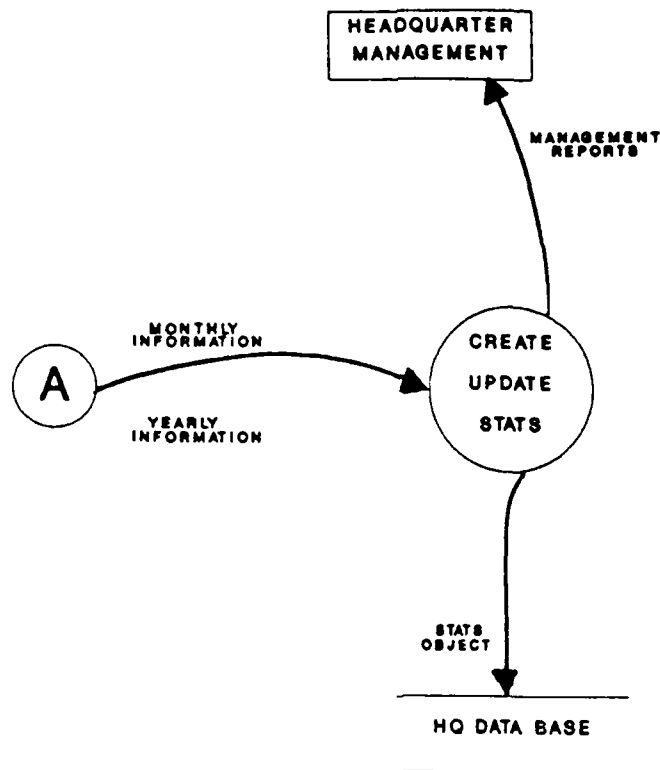


Figure 2.4 STATS (HQ) Data Flow

b. External Control

External processes will augment database control. Access to the system for display of information will be controlled externally by the user command limiting physical access to the computer equipment to appropriate personnel. It will be left to physical security procedures to control routine access to the system's information display capabilities. Similarly, external processes will be used to

help regulate database updates. The user's manual (Appendix K) will provide structured guidelines for system use including data update procedures.

c. Other Requirements

During the interview process, several problems were identified. Data entry may not be accomplished on a daily basis. Provider's daily work sheets may be totalled and submitted at the end of the work week. Even if the provider's work sheet is submitted daily, the technician entering DIRS information may not have sufficient time to input data until the next day or even several days later. The DIRS must be flexible enough to handle this type of erratic schedule of data input. The DAILY object is needed to verify that data entered corresponds to the data reported on the provider's work sheet.

Due to data storage limitations, the structure of the proposed system needs to offer several additional capabilities to users; file size grows only as required by the number of actual instances of treatments provided, not by arbitrary structure based on all possible treatments, per all beneficiary categories for each provider. An application with relations structured in this manner would soon exhaust available data storage capacities unless frequently purged. An efficient database design shall allow treatment instances to be updated and totalled in year-to-date totals rather than adding an additional record, yet still provide data extraction

capabilities for internal and external reporting. Appendix H contains examples of sample reports.

The seven objects identified earlier are required in the structure of the proposed DIRS to meet the following requirements:

- The system must provide update mechanisms.
- Utility functions must be incorporated into the system to provide easy file backup and file organization such as indexing.
- The system dialogue must be easy for non-ADP personnel to follow and use.
- The system must have the capability of exporting requested information to floppy disk and at the headquarters level, to import branch clinic data to the Headquarters database.

Several reports have been requested by the sponsoring activity. Headquarters must be capable of generating the required branch clinic OCR monthly report directly onto NAVMED 6600/11. Annual treatment reports similar in format to the monthly report shall be printed on request. Summaries and full Providers' performance reports also shall be available on request. Individual provider reports shall be generated monthly and submitted to the corresponding provider for his or her own personal performance information.

An additional requirement identified by the sponsoring activity, as discussed previously, is support for multiple DTF's under one command. During user interviews, it was determined that the proposed DIRS must be capable of

supporting up to nine DTF's under a single Headquarters command. Further, with multiple DTF's, the possible variety of hardware configurations requires that the proposed DIRS be generalized or "generic" to support the varied functions and requirements of a specific DTF. Though it may not always be the case in systems analysis and design, in this instance, the users' view of the objects to be captured by the DIRS, coincides closely with the actual application functional requirements used to model the users' view of the system.

The computerized DIRS proposed and developed in the scope of this thesis will meet the reporting requirements of a Headquarters Clinic with up to nine subordinate DTF's. Through the user-interview process and dental clinic command structure review, the provision to support up to nine DTF's in the proposed program was identified to allow future expansion of the program in the event of dental command reorganization, without requiring modification of the database structure. Currently, NAVDENCLINIC Long Beach, Ca., is one of the largest DTF Headquarters commands with five subordinate DTF's.

In addition to the required features, the proposed system will allow subordinate units to report their monthly totals via either modem or "floppy" medium to their Headquarters Clinic. At the Headquarters level in the proposed DIRS, the input of the subordinate DTF's will be combined to generate the requisite NAVMED 6600/8 for submission to COMNAVMEDCOM. The proposed DIRS offers the

elimination of much of the manual handling and transcribing of daily count sheets, and offers accurate computerized completion of the OCR-A NAVMED 6600/8.

Update, Display and Control Mechanisms required for the DIRS may be found in Appendix E.

III. SYSTEM DESIGN

The third phase of the systems analysis process is system design. In this phase, the basis for the underlying structure of the database is delineated and built. The system design phase is sub-divided into the logical design phase and application design phase. The foundation established in the design phase is critical to successful development and maintenance of DIRS. The objective of logical database design is to translate the system blueprint identified in the requirements phase and to develop a set of relation diagrams, relation definitions, domain definitions and a list of constraints.

A number of approaches to database design exist, and a brief discussion of some of the relevant issues includes the concepts of relations, keys, relationship constraints and normalization. The second phase of system design, application design, will describe the actual scope of DIRS, control mechanisms used, a description and depiction of the menu hierarchy.

A. LOGICAL DATABASE DESIGN

The relational database model will be used to develop the logical design of DIRS. This model translates the objects identified from analysis performed during the requirements phase into a relational design. The relation is logically

equivalent to a file, which contains rows and columns. A row in a relation table represents a record or tuple. Each column in a relation is termed an attribute or field. A process known as normalization is used to collect related data properties into robust well-designed relational (relation) tables. A well-structured design will "allow rows to be inserted, deleted, and modified without resulting in inconsistencies or errors in the stored data." [Ref. 3] Normalization serves to identify and eliminate these modification anomalies. Relations which correspond to DIRS are graphically depicted in Appendix F.

1. Normalization

Gathering or grouping of properties or data items into relations is an important aspect of database design. This process of "normalization" is used to eliminate database design weaknesses or flaws. These problems or "anomalies" as they are called, can result in inadvertent deletion of facts in a relation, or artificial and unintended restrictions on entity insertion. These modification or update anomalies are termed deletion anomalies or insertion anomalies respectively. The theoretical framework concerning proper database design is derived from early database design work of E.F. Codd who provided the definition of possible normal forms that relations may take. Normalization is the process by which we "troubleshoot" the database structure to identify and remove anomalies discovered. To do this, data items or properties

are grouped into relations as previously discussed. Object diagrams provided in Appendix A and relation diagrams provided in Appendix F depict groups of related properties upon which normalization is based. All relations are in at least first normal form. In the relations created within the scope of this thesis, each is at least in third normal form (3NF). "A relation is in third normal form if it is in second normal form and has no transitive dependencies." [Ref. 3:p. 143] Second normal form is defined as a relation in which "all non-key attributes are dependent on all of the key." [Ref. 3: p. 142]

2. Keys

"A key is a group of one or more attributes that uniquely identifies a row. Every relation has at least one key. Sometimes the key is one attribute." [Ref. 3:p. 139] In the example provided in Appendix F, the keys are underlined. In the PROVIDER object, the underlined attribute is Prov Code, a three digit code which serves to uniquely identify any provider in the system. It is possible that a group of attributes will be required to "functionally determine" (serve as a key to uniquely identify) other non-key attributes.

3. Relations

Relations are created by examining object diagrams (Appendix A) to determine relationships among objects (depicted in Appendix F), then transforming these objects into

relations such as those described below. Depiction of an object may be relatively simple or may require the composition of several relations. Database objects (Appendix A), and relation diagrams (Appendix F) provide examples of such composition. A simple object contains only single-valued, non-object properties, and may be represented by a single relation. A composite object contains one or more non-object multivalued properties, and requires more than one relation for their representation. A compound object contains at least one object property, requiring translation of that object into a minimum of two relations. As an example, the MONTHLY object in Appendix A contains the object property COMMAND and the multivalued object DAILY. Each of the seven objects in Appendix A is a compound object, containing at least one other object property each depicted by its own relation as depicted in Appendix F. [Ref. 3]

4. Relationships

A binary relationship involves only two record types. Whereas an object was converted on a one-to-one basis into a relation (record type), relationships between those record types are not necessarily limited to one-to-one. In fact, in this database the majority of relationships are one-to-many. Referring again to the relation diagrams of Appendix F, a given STATS (HQ) may have multiple commands associated with it, as indicated by the "fork" on the command end of the connecting line. Similarly, a command can have many providers

and a provider will provide many treatments to many beneficiary category codes during the course of a daily (visit).

There are a number of classifications pertaining to the degree of relationship that exists between objects, varying in complexity from no relationship between objects (0:0), to a many-to-many relationship (M:N). For example, in a one-to-one (1:1) relationship, one record is related to only one other record of another type. Additional explanation is required for notation used in Figure 3.1 and Appendix F, to indicate the type of relationship between record types. Beyond the "forked" end of the line which is used to indicate a "many" (as in one-to-many), on the line connecting two objects or relations together, there may be either a circle or a bar. This notation is found on both ends of the line connecting the records, and is used to describe an optional or mandatory association between records. These associations are a type of relationship constraint.

5. Relationship Constraints

Relationship constraints such as those presented in a simplified version of DIRS Relationships are provided in Figure 3.1 below, with the detailed relationship structure provided in Figure 3.2 and Appendix F. If a relationship is mandatory, a bar will be found perpendicular to the opposite end of the line (side closest to the mandatory association). In the case of the **COMMAND** and **PROVIDER** objects in Figure 3.1,

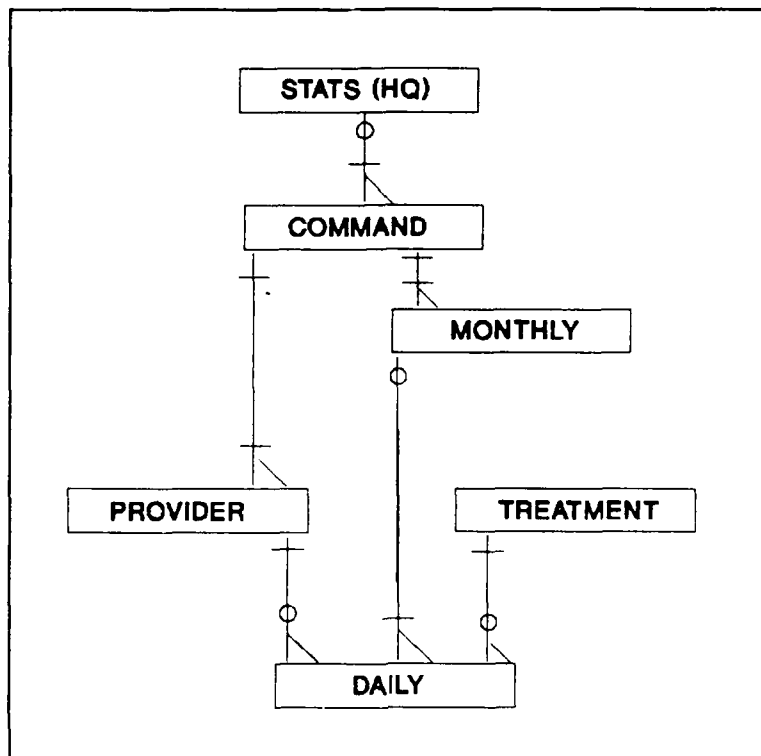


Figure 3.1 DIRS Relationships

it is mandatory that a **COMMAND** have a **PROVIDER**, and that a **PROVIDER** have a **COMMAND**. However, the circle found nearest **STATS (HQ)** on the line connecting **COMMAND** and **STATS (HQ)** indicates that while **STATS HW** must have a **COMMAND** associated with it, a **COMMAND** may have a (HQ) associated with it, but it is not mandatory, as **COMMAND** could stand alone.

To accommodate the nuances of this reporting environment, and attain user functional requirements, the structure of database object relationships depicted in Figure 3.2 was

developed. Database relations identified remain identical to those represented above in Figure 3.1. The **STATS (HQ)** relation consists of the key attribute, **UIC** and each attribute belonging to **COMMAND**. **UIC** can serve as a key attribute for each relation because this five-number code is uniquely assigned to individual units. Relations containing other relations are identified by attribute names presented in all capital letters (with the exception of **UIC**). **COMMAND**, then, contains two other relations; **PROVIDER** and **YEAR**, each containing all attributes displayed within their respective boxes above, and in both appendices A and B. The **Name** attribute refers to Navy-assigned command plain language addresses, while **MEPRS Code** describes the four-digit work center code required on DOD dental reports. **COMMAND** has obvious relationships with **PROVIDER** and **YEAR**, as diagrammed by vertical lines connecting these relations, and more subtle relations through these two relations to all other relations. No object exists in isolation. It must be tied (related) to at least one other object. These relations may be optional (circles) or mandatory (short horizontal line) as described earlier, and evidenced in Figure 3.2.

YEAR, as defined by key relations **COMMAND** and **MONTHLY**, also contains an individual attribute for each beneficiary category code listed in Figure 2.2.

In this manner, all treatments performed on members of a specific beneficiary code, for a particular month and at a

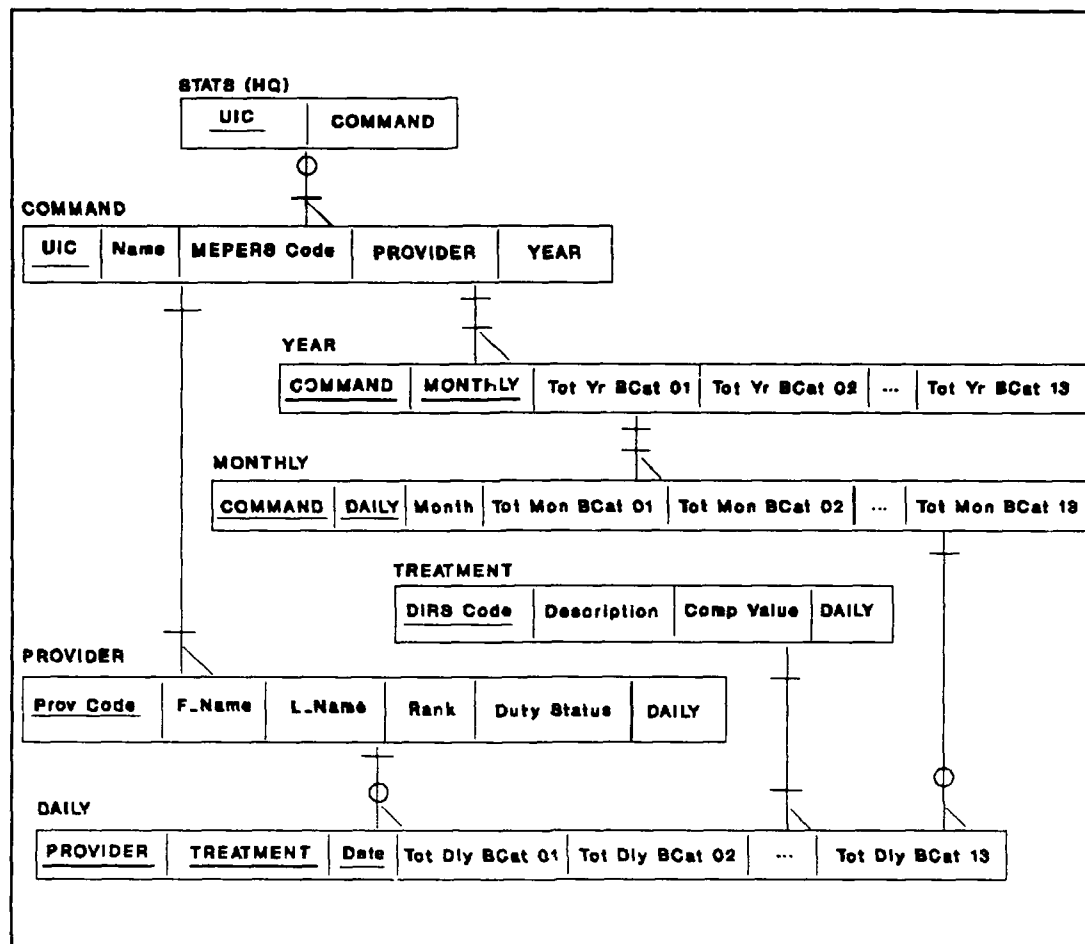


Figure 3.2 DIRS Relation Diagram

specific command, are delineated and totalled separately. Similar structuring of attributes contained in both **MONTHLY** and **DAILY**, allows provisions for data extraction or combination, while always retaining identification of data origin. For example, **PROVIDER** contains the key attribute Prov Code, in addition to attributes; first name, last name, rank, duty status, and the **DAILY** object. This structure means that if a provider performs a treatment on a specific day, each

attribute of **TREATMENT**; DIRS code, description of treatment, composite value and **DAILY**, is included in data specific to that provider. To identify a unique **DAILY** object instance; **PROVIDER**, **TREATMENT** and date, together serve as keys. User requirements identified the necessity for storage of a year of DIRS data on disk at a time. To support this specification, the **DAILY** relation is designed as a temporary object, with data values added to update **MONTHLY**, at each convenient data entry session. Structured in this manner, all required data manipulation capabilities are supported with minimum disk storage overhead. Inclusion of daily beneficiary category totals to **DAILY**, permits accurate characterization and summation by category, stats (HQ), individual command, year, month, provider or treatment, for a particular instance or total to date.

The structure described above offers several advantages to users; file size grows only as required by the number of actual instances of treatments provided, not by arbitrary structure based on all possible treatments, per all beneficiary categories for each provider. An application with relations structured in this manner would soon exhaust available data storage capacities unless frequently purged. Efficient database design allows treatment instances to be updated and totalled in year-to-date totals rather than adding an additional record, yet still provide data extraction capabilities for internal and external reporting. Several

reports are supported in addition to provisions for automatic formatting and generation of the required monthly NAVMED 6600/8 using an OCR font printer. User desires for daily, monthly, annual, provider statistics and major treatment reports shall be supported options in the Report menu. Additional provisions for file import/export and maintenance shall be supported as described in the file utilities menu section. Support requests for possible expansion of up to nine subordinate DTFs under a single headquarters command is provided in accordance with user criteria. This support means that data from subordinate commands exported to a headquarters may be sub-totalled in as many as ten total categories. Additional features are discussed under menu hierarchy descriptions later in this chapter.

B. APPLICATION DESIGN

In following the object-oriented methodology, the application design phase will include determination of number and scope of applications, design control mechanisms for identified applications, and identify specific procedural logic. Additional considerations include; design materializations, database security and integrity.

The data flow diagrams developed in the user requirements phase to help document flows of information, identify scope of required information needs, and describe required structure of

the organization, are used in the current phase to assist in the creation of the functional hierarchy.

1. Application Control Mechanisms

"An application is the user's interface with the database." [Ref. 3] This interface must include the capacity for recognizing when data values entered are of an appropriate type and are within the intended range for the respective field. The users and developers consider extensive use of menus as the most appropriate user-system interaction method for a given application. On-screen templates (or masks, as previously discussed) will aid data entry process by restricting allowable data types (alphabetic, numeric, etc.) to the appropriate field. Pop-up help screens provide additional control in guiding users. Most DIRS on-screen messages are self-explanatory. Pre-established escape procedures, such as pressing any key on the initial or first blank field will allow users to abort an operation and return to a previous menu, or to exit the system entirely. An additional escape provision is available from within any level by pressing the escape key.

Intuitive feel and simplicity of design allow not only shortened operator training time, but also permits the developers to limit deviations from the acceptable range of values for a given task or command. Consistent use of function keys to provide case sensitive help screens and

standardized conventions for interfacing with the application, also streamline user familiarity process.

As previously stated, to accommodate the wide variety in computer literacy existing among potential system users, a menu-driven application was selected as the most appropriate application control mechanism. The next design step required the determination of menu hierarchy. Furthermore, it was determined that an object/action approach would best serve user needs. An object/action approach means "the highest-level menu offers the user a list of objects that might be processed, and lower-level menus enable the user to indicate the action to be taken on the selected object." [Ref. 3]

An important design consideration for DIRS developed in the course of this thesis is not limiting the system to only one command. For example, Unit Identification Code (UIC), command name and UCA code must not be hardcoded in the program. This requirement will be accomplished upon initial installation of the system. A memory file will be created at that time containing the UIC, Command name, and related UCA codes for the appropriate command. Creation of this object as a memory file within random access memory (RAM) creates efficiency gains, saving multiple disk seek and access times. This object is frequently called as a visual aid in the form of a pop-up menu. As an example, a subordinate command is not required to reenter its UIC for each instance of DIRS data

input for a daily transaction, as object relation design results in automatic updates to related attributes.

C. MENU HIERARCHY DESCRIPTIONS

Menus used in the DIRS application were derived from an analysis of user requirements and data flow diagrams. Menus corresponding to these diagrams and structures are briefly described in the following section. Figure 3.3 depicts the

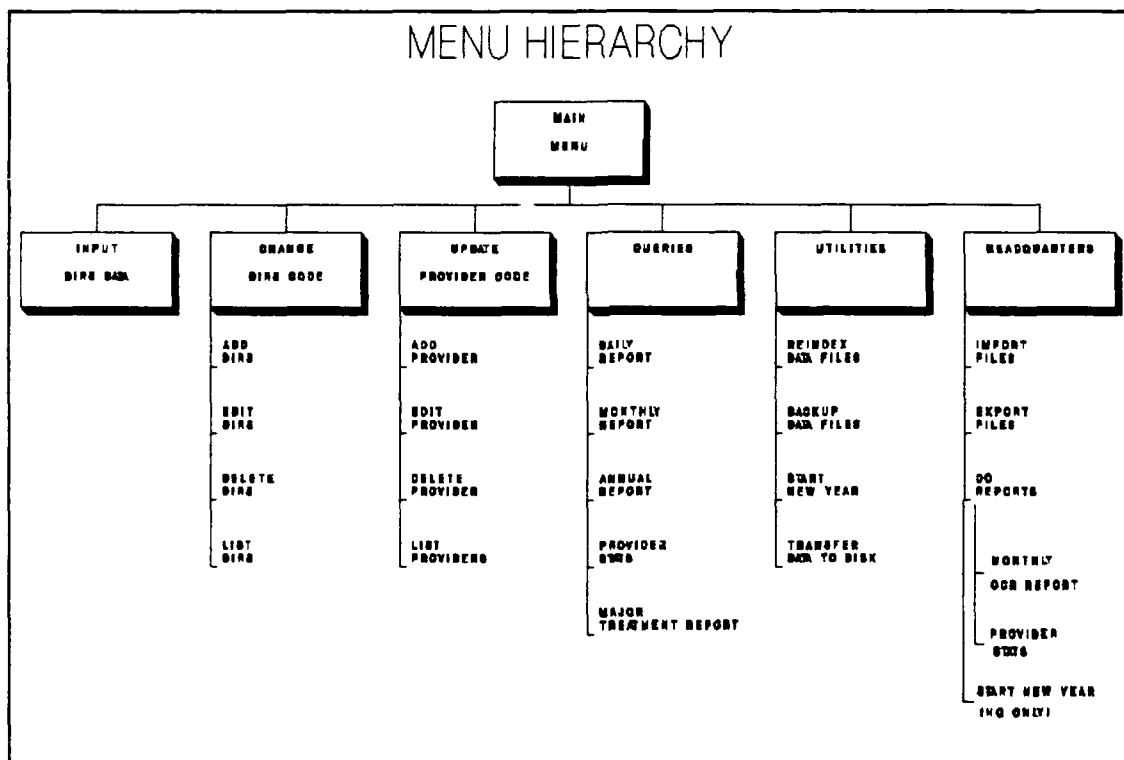


Figure 3.3 Menu Hierarchy

menu structure hierarchy which provides graphic information pertaining to specific applications, objects, or tasks assigned to a block, module, or sub-module supported.

1. Main Menu

DIRS main menu shall offer system user options depicted in Figure 3.4. In every menu screen provided, an option may be selected by highlighting the desired selection or by typing the first letter of the desired option. The final option available on each menu screen is a provision for exiting to the next higher level menu, or in the case of the main menu, exiting DIRS to the operating system.

As depicted in the following diagrams, each menu screen in the menu hierarchy exhibits common structure, consisting of three distinct parts. User information is provided in part A, with DTF command name, system name, current time and date, and screen number identified. Part B presents available menu options, part C provides option selection instructions and error message display.

Heading

| | | |
|-----------|---|-----------------------------------|
| A | NAVAL DENTAL CLINIC, USN DENTAL INFORMATION RETRIEVAL SYSTEM | 13:17:17 01/13/90 SCREEN # 1.0 |
| ----- | | |
| MAIN MENU | | |
| B | INPUT DIRS DATA CHANGE DIRS CODES UPDATE PROVIDER CODES QUERIES FILE UTILITIES HEADQUARTERS ONLY QUIT | |
| ----- | | |
| C | USE UP AND DOWN CURSOR KEYS ↑↓ TO HIGHLIGHT ITEM AND PRESS<RETURN> | |

Prompt & Status Box

Figure 3.4 Main Menu Screen

To operate DIRS, users shall enter the first letter which corresponds to the item in the menu body to be selected, or move the arrow keys (↑↓) to highlight an option. All menus have a RETURN option to return to next higher menu in the hierarchy.

a. Input DIRS Data

The first screen that will appear when selecting option one (INPUT DIRS DATA) is displayed below (Figure 3.5). Enter "Y" (yes), if the displayed month is the desired month for data entry. Enter "N" (no) to select another month. When "N" is selected a window will appear displaying options that may be keyed in at the prompt (see open month screen below). The default month (open month on screen) is the current calendar month based on the computers system clock.

| | | |
|-------------------------------------|----------|----------|
| NAVAL DENTAL CLINIC, USN | 08:05:14 | 01/13/90 |
| DENTAL INFORMATION RETRIEVAL SYSTEM | SCREEN # | 1.1.1 |
| ----- | | |
| OPEN MONTH IS JANUARY | | |
| ----- | | |
| IS THIS CORRECT? Y/N | | |

Figure 3.5 Month Prompt Screen

To select the correct month, the three letter abbreviation is entered at the prompt. For example, typing

JUN in the month selection screen will open that month for data entry. Once the desired month has been opened, the provider prompt screen will follow (Figure 3.6).

| | | | |
|---|-----|----------------|----------|
| NAVAL DENTAL CLINIC, USN | | 09:02:20 | 01/13/90 |
| DENTAL INFORMATION RETRIEVAL SYSTEM | | SCREEN # 1.1.1 | |
| ----- | | | |
| JAN | JUL | | |
| FEB | AUG | | |
| MAR | SEP | | |
| APR | OCT | | |
| MAY | NOV | | |
| JUN | DEC | | |
| ----- | | | |
| ENTER THREE LETTERS OF NEW MONTH: _____ | | | |

Figure 3.6 Month Selection Screen

In selecting a provider, the provider code may be entered directly if the code is known, or by pressing the <HOME> key, an additional window with the valid provider codes assigned to the reporting command will pop up. From the available valid provider codes on screen, the corresponding number that matches the desired provider code may be entered. (See Figure 3.7 and Figure 3.8.)

To select a valid provider, enter the matching number in the leftmost column, i.e.: entering number "1" would select provider 100; CDR Navy. The provider code may also be entered directly on the provider input screen. This method of provider data entry provides a method to check the

| | |
|-------------------------------------|-------------------|
| NAVAL DENTAL CLINIC, USN | 08:18:58 01/13/90 |
| DENTAL INFORMATION RETRIEVAL SYSTEM | SCREEN # 1.1.1 |

PROVIDER CODE:

ENTER PROVIDER CODE OR PRESS <HOME> FOR HELP

Figure 3.7 Provider Prompt Screen

| | |
|-------------------------------------|-------------------|
| NAVAL DENTAL CLINIC, USN | 08:18:58 01/13/90 |
| DENTAL INFORMATION RETRIEVAL SYSTEM | SCREEN # 1.1.1 |

| PROVIDER | CODE | RANK | NAME |
|----------|------|------|------------------|
| 1. | 100 | CDR | NAVY, JOSEPH |
| 2. | 200 | LT | NAVY, SON |
| 3. | 300 | LT | MESIAL, DECAY |
| 4. | 400 | CAPT | TOOTH, DECAY |
| 5. | 455 | LT | RESERVE, DENTIST |
| 6. | 500 | CDR | BUCKLE, PIT |
| 7. | 600 | LT | LINGUAL, DISTAL |
| 8. | 700 | ADM | DENTAL, SERVICE |

PRESS NUMBER OF ITEM, RETURN TO CONTINUE, OR "Q" TO QUIT

Figure 3.8 Provider Selection Screen

provider code file to validate a correct provider code for the reporting unit. Entering an erroneous code (a code not currently in the provider code file) results in an error message indicating that fact, and further prompts the user to enter another code.

When the provider field is correctly entered, the screen displayed in Figure 3.9 will follow, prompting the user

to enter a valid treatment code. As previously discussed, to escape the DIRS entry routine, press <RETURN> at a blank DIRS field.

| | | |
|---|----------|----------|
| NAVAL DENTAL CLINIC, USN | 08:05:14 | 01/13/90 |
| DENTAL INFORMATION RETRIEVAL SYSTEM | SCREEN # | 1.1.2 |
| ----- | | |
| Entering Data for Provider: CDR JOSEPH NAVY CODE: 100 | | |
| ----- | | |
| PRESS THE <HOME> KEY FOR A LIST OF DIRS CODES TO | | |
| SELECT FROM. | | |
| PRESS <RETURN> ON AN EMPTY FIELD TO RETURN TO THE | | |
| MAIN MENU. | | |
| ----- | | |
| ENTER DIRS CODE: | | |

Figure 3.9 DIRS Code Prompt

Pressing the <HOME> key will display all valid DIRS codes (Figure 3.10). DIRS treatment code may also be entered directly on the DIRS prompt screen or the <HOME> key may be used to assist the user in the event that correct DIRS codes are unknown. This help function is not a mandatory input procedure.

To select a DIRS treatment code, the corresponding number displayed in the leftmost column is selected by typing the appropriate number ("1"-"9"). Pressing the <Page Down>

| | |
|-------------------------------------|-------------------|
| NAVAL DENTAL CLINIC, USN | 08:05:14 01/13/90 |
| DENTAL INFORMATION RETRIEVAL SYSTEM | SCREEN # 1.1.2 |

| DIRS CODE | DESCRIPTION | WEIGHT |
|-----------|-----------------|--------|
| 1. 0001 | POUR CAST | 2.0 |
| 2. 0002 | POUR CAST,FX | 4.0 |
| 3. 0003 | BOX AND POUR | 5.0 |
| 4. 0004 | IMP TRAY CUS | 4.0 |
| 5. 0005 | POUR ALT CAST | 5.0 |
| 6. 0006 | ARTIC. SIMPLE | 1.0 |
| 7. 0007 | ARTIC. SEMI | 1.5 |
| 8. 0008 | ARTIC. FULL | 2.0 |
| 9. 0009 | SOLDER/PER AREA | 4.0 |

PRESS NUMBER OF ITEM, RETURN TO CONTINUE, OR "Q" TO QUIT

Figure 3.10 DIRS Code Selection Screen

or <Page Up> keys will scroll through the list to display other treatment codes.

Data entry for an individual provider is accomplished using screen 1.1.3 depicted in Figure 3.11 by entering in the correct quantity of procedures completed in each dental beneficiary category. The <RETURN> key is used to move the cursor to the next field for data entry. The steps listed above are repeated until the user has completed data entry for a particular provider. Data entry error corrections are accomplished in a number of ways. The user is prompted with the following query at the bottom of screen 1.1.3; "Is this data correct? Y/N." A negative response indicated by typing the "N" key, will allow the user to reenter the correct data. The user may overwrite the data

| | | | |
|-------------------------------------|----------------------|-------------------|-----------------|
| NAVAL DENTAL CLINIC, USN | | 12:04:39 01/13/90 | |
| DENTAL INFORMATION RETRIEVAL SYSTEM | | SCREEN # 1.1.3 | |
| ----- | | | |
| Entering Data for Provider: | | TEST | TEST |
| DIRS Code: 0120 | | CODE: 100 | |
| Beneficiaries | Additions to File | Totals in File | Year to Date |
| Category 1 | 0 | 0 | 0 |
| Category 2 | 0 | 0 | 0 |
| Category 5 | 0 | 0 | 0 |
| Category 8 | 0 | 0 | 0 |
| Category 9 | 0 | 0 | 0 |
| Category 10 | 0 | 0 | 0 |
| Category 11 | 0 | 0 | 0 |
| Category 12 | 0 | 0 | 0 |
| Category 13 | 0 | 0 | 0 |
| ----- | | | |
| ENTER NEW VALUES AND PRESS RETURN | | | |

Figure 3.11 Daily Input Screen

displayed on screen by moving the cursor using arrow keys to the correct field and reentering the correct quantity. Deletion and editing of values previously entered for a particular month is accomplished by selecting the desired month, provider, and treatment, and entering an appropriate negative value to either cancel or modify the monthly total for the selected record. To return to the main menu, the <RETURN> key is pressed with the cursor on a blank DIRS input field or typing "Q" when prompted from the help screen. When a month and provider have been selected, the user may continue adding new treatment data without the requirement of returning to the main menu for each instance. To enter data for another

provider, users must return to the main menu and select the desired month and treatments. The system shall default to the month of last data entry. Upon termination of a data entry session, a final query will prompt the user with the following message; "Do you wish to save this data? Y/N." Selecting "N" will not save the data entered during the session. This particular feature is provided as another control mechanism, allowing the user to correct or terminate a data entry session without arbitrary input of inadequately screened or inaccurate data to the database. Selecting "Y" will automatically result in appropriate updates to the Daily, Monthly, and Yearly object files. Selection of "Y" will also result in the display of the following messages in the status box of the menu screen (part C); "Adding to Monthly Total" and "Adding to Yearly Total," informing the system user of action in progress. Again, listing command providers is provided as a convenience to the system user.

b. Change DIRS Codes

Selection 2 from the main menu (CHANGE DIRS CODES, Figure 3.12) is used to add, delete, or edit the DIRS (treatment) code file. Deleting means erasing of an existing code in the file. Editing means changing an existing code. When calling these functions, the procedure is similar to that of data entry described in the DIRS entry section.

```
NAVAL DENTAL CLINIC, USN          12:47:51  01/13/90
DENTAL INFORMATION RETRIEVAL SYSTEM SCREEN # 1.2
-----
```

DIRS CODES MENU

```
ADD CODE
EDIT CODE
DELETE CODE
LIST CODES
RETURN TO MAIN MENU
-----
```

```
USE UP AND DOWN CURSOR KEYS ↑↓ TO HIGHLIGHT ITEM AND
PRESS<RETURN>
```

Figure 3.12 Update DIRS Codes Menu

c. Update Provider Codes Menu

The function of the Update Provider Codes menu (Figure 3.13) is similar to that described above for Change DIRS Codes. In this instance, rather than treatment codes,

```
NAVAL DENTAL CLINIC, LONG BEACH, CA. 12:47:51  01/13/90
DENTAL INFORMATION RETRIEVAL SYSTEM   SCREEN # 1.3
-----
```

PROVIDERS CODE MENU

```
ADD CODE
EDIT CODE
DELETE CODE
LIST CODES
RETURN TO MAIN MENU
-----
```

```
USE UP AND DOWN CURSOR KEYS ↑↓ TO HIGHLIGHT ITEM AND
PRESS<RETURN>
```

Figure 3.13 Update Provider Codes Menu

update function and display function pertains to the treatment provider at a given command.

d. Report Menu

Branch clinic report menu (Figure 3.14) presents users with a number of options related to reporting of DIRS data by various chronological periods. Using the options available in this menu, the current total of treatments, treatments by provider, by command, etc., may be obtained. Additionally, a Major Treatment Report option is available as a menu selection for internal reporting purposes. Examples of each report selection are provided in Appendix H.

| | | |
|---|--------------|----------|
| NAVAL DENTAL CLINIC, LONG BEACH, CA. | 12:49:38 | 01/13/90 |
| DENTAL INFORMATION RETRIEVAL SYSTEM | SCREEN # 1.4 | |
| ----- | | |
| REPORT MENU | | |
| DAILY REPORT | | |
| MONTHLY REPORT | | |
| ANNUAL REPORT | | |
| PROVIDERS STATS. | | |
| MAJOR TREATMENT REPORT | | |
| RETURN TO MAIN MENU | | |
| ----- | | |
| USE UP AND DOWN CURSOR KEYS ↑↓ TO HIGHLIGHT ITEM AND PRESS<RETURN> | | |

Figure 3.14 Branch Clinic Report Menu

e. File Utilities Menu

Menu screen in Figure 3.15 offers system users the ability to reindex, backup, transfer, and start a new recording year all from within the DIRS application. Providing these necessary functions from within the system as menu-driven options helps simplify the normally onerous and often neglected tasks such as backing up system data.

The reindex data files option should be selected when the system shows signs of incorrect operation such as incorrectly assigned totals or data. As an example, reports may display zero work for all providers at a specified command for a given month. If this information is incorrect, using the reindex option will reassign the appropriate key field to their respective records. The reindex feature is often required in any database system. Power surges, improper file closing and hardware malfunctions are examples of possible causal factors for index distortion. The reindex option is provided to reestablish the proper links and pointers to correct the potential damage caused by these malfunctions. Simplicity inherent in the menu interaction format, should help increase the frequency of back-ups and maintenance of application data.

The "Start New Year" option is provided when the users wish to begin recordkeeping functions for a new reporting year; either calendar, fiscal or other arbitrary selection. Failure to select this option when starting a new

```
NAVAL DENTAL CLINIC, LONG BEACH, CA. 13:50:16 01/13/90
DENTAL INFORMATION RETRIEVAL SYSTEM  SCREEN # 1.5
-----
```

FILE UTILITIES

```
REINDEX DATA FILES
BACKUP DATA FILES
START NEW YEAR
TRANSFER DATA TO DISK
RETURN TO MAIN MENU
-----
```

```
USE UP AND DOWN CURSOR KEYS  ↑↓  TO HIGHLIGHT ITEM AND
PRESS<RETURN>
```

Figure 3.15 File Utilities Menu

reporting period will result in overwritten data values and incorrect totals for the selected period.

The "Transfer Data to Disk" option is selected to transfer data for a monthly reporting period to a "floppy disk" for subsequent export to the appropriate Headquarters command. Production of the OCR report form may only be accomplished at the Headquarters level after import of the transfer files.

Selection of transfer routine will transfer the working file to a floppy disk. The UIC window located in the lower right corner depicted in Figure 3.16 prompts the user to select a number; 1 through 5. The number "5" is representative of a Headquarters command with five subordinate DTFs. This number will reflect the actual number of DTFs supporting as few as one or as many as nine. If the system

NAVAL DENTAL CLINIC, USN
DENTAL INFORMATION RETRIEVAL SYSTEM

13:51:59 11/10/89
SCREEN # 1.5.4

ENTER UIC:

ENTER MONTH OF REPORT:
i.e.:

*** VALID UIC ***

- 1) 00000 - HQ & NOWHERE
- 2) 55555 - PORT NEVERSAIL
- 3) 55511 - POINT HERE
- 4) 51515 - CHINA
- 5) 99999 - C O BEACH

0) RETURN TO MAIN MENU

SELECT (0 - 5)? 0

Figure 3.16 Transfer Data to Disk Screen

is being used at a branch clinic, only one UIC is displayed and selected. User input of the correct UIC is critical, because a UIC FIELD will be appended on the TRANS. FILE based on the UIC input. The TRANS. FILE is the database export file to be received by the corresponding Headquarters command. This routine will be selected when a subordinate DTF is required to submit data to headquarters. Regardless of transmission medium, the export routine must be selected to transfer all data to floppy disk, prior to submission of the updated monthly data requirements. The export procedure described above provides a necessary if subtle control mechanism ensuring that data back-ups are performed at least once a month. When properly labeled with the appropriate UIC, and month of transfer, the floppy disks containing the TRANS

database file (dbf) provide a convenient source of back-up data. The menu status box (part C) will provide a prompt to insert a floppy disk into the appropriate drive, and a message indicating the number of records transferred.

f. Headquarters Menu

Headquarters menu (Figure 3.17) is intended for a Headquarters command to facilitate transfer of DIRS data from subordinate dental commands, and the obligatory submission of DIRS reports. To that end, file import/export facilities are provided as menu options for operation from within the DIRS application.

| | | |
|---|--------------|----------|
| NAVAL DENTAL CLINIC, LONG BEACH, CA. | 13:53:44 | 01/13/90 |
| DENTAL INFORMATION RETRIEVAL SYSTEM | SCREEN # 1.6 | |
| ----- | | |
| HEADQUARTER'S MENU | | |
| IMPORT FILES | | |
| EXPORT FILES | | |
| DO REPORTS | | |
| START NEW YEAR (HQ ONLY) | | |
| RETURN TO MAIN MENU | | |
| ----- | | |
| USE UP AND DOWN CURSOR KEYS ↑↓ TO HIGHLIGHT ITEM AND PRESS<RETURN> | | |

Figure 3.17 Headquarter's Menu

"IMPORT FILES" option is provided to receive files transmitted from subordinate commands. Similarly, the "EXPORT FILES" option is provided to allow a Headquarters command to

send a pre-selected month of data for all of its subordinate commands. Selection of the "DO REPORTS" option will result in the display of the screen presented in Figure 3.18 with provisions for selection of either the DIRS OCR format monthly report or a "PROVIDERS STATS" internal report option.

| | | | |
|---|--|----------------|----------|
| NAVAL DENTAL CLINIC, LONG BEACH, CA. | | 13:53:44 | 01/13/90 |
| DENTAL INFORMATION RETRIEVAL SYSTEM | | SCREEN # 1.6.2 | |
| ----- | | | |
| HEADQUARTER'S REPORTS | | | |
| MONTHLY DIRS REPORT | | | |
| PROVIDER STATS. | | | |
| RETURN TO MAIN MENU | | | |
| ----- | | | |
| USE UP AND DOWN CURSOR KEYS ↑↓ TO HIGHLIGHT ITEM AND PRESS<RETURN> | | | |

Figure 3.18 Headquarters Report Menu

The "MONTHLY DIRS REPORT" selection option is supported by the menu screen presented in Figure 3.19. This selection will enable Headquarters to print the standard monthly NAVMED 6600/8 OCR form required for submission of DIRS data to COMNAVMEDCOM using an OCR font capable printer.

The Provider Stats option at Headquarters level is a compilation of all subordinate DTF's Provider Stats reports. an example of the Provider Stats Report is provided in Appendix H.

NAVAL DENTAL CLINIC, LONG BEACH, CA. 11:50:26 11/10/89
DENTAL INFORMATION RETRIEVAL SYSTEM SCREEN # 1.5.1

SELECT UIC: 00000

Name of Facility: SEE TABLE 1

Provider's Hours: 12.00

(1) Original | --
(2) Correction | Select
(3) resubmission | (1-3)?
| --

*** VALID UIC ***

1) 00000 - HQ & LB CLINIC
2) 55555 - PORT NEVERSAIL
3) 55544 - POINT HERE
4) 51515 - CHINA
5) 99999 - C O BEACH

0) RETURN TO MAIN MENU

SELECT (0 - 5)? 1

IS DATA CORRECT (Y/N)?

Figure 3.19 HQ OCR DIRS SCREEN

The "START NEW YEAR (HQ ONLY)" option provided on the Headquarters menu is identical in function to that provided by the "START NEW YEAR" option for subordinate DTFs except that it only reinitializes the Stats database. As previously discussed, this option is used to initialize records to zero, providing recordkeeping functions for a new reporting year; either calendar, fiscal or other arbitrary selection.

IV. SYSTEM IMPLEMENTATION

A. INTRODUCTION

The final step in systems analysis is system implementation. At this step, the chief objective is in building the system physical design which provides precise functionality users desire, and most closely mirrors logical design specifications. It is in this step that the components of database design, relations, rows and attributes, are translated into DBMS-specific tables, records and fields.

The DBMS selected for use in this task is dBASE III PLUS, a product of Ashton-Tate. The specifics of both dBASE III PLUS, and QUICKSILVER, the compiler program used, will be addressed following a discussion of methods used to generate database tables and screens.

1. Tables

During user requirements phase, application data requirements were identified and were presented as objects. These objects were then translated into relations in the logical design phase. In the implementation phase, these relations are translated into DBMS-specific (in this application, dBASE III PLUS) tables. "The order of fields within a record is the same for every record in the file, and is called the file structure." [Ref. 4] This file structure is designed to support specifics of individual DBMSs by

establishing the order, length, number of fields and data type in each record.

2. Screen Design

During user requirements phase, the second task was to fully specify system functional requirements. The established methodology to most easily describe the requirements is through the use of dataflow diagrams (DFD). A dataflow diagram is "a chart used by systems analysts to illustrate business functions and their data interfaces. Sometimes called a bubble chart." [Ref. 3] During logical design phase DFDs were converted into menus. Use of these menus serves as a control mechanism to prevent update anomalies during file maintenance operations (insertions, deletions, and modifications). In the implementation phase menus are translated, providing a mechanism to manipulate data through screens or views, which are materializations of objects. An object is a specific instance or representation of one particular entity such as a provider or a treatment. It is important to note that "entities are perceptions and may or may not be physical." [Ref. 3] This distinction is important because a screen or view may represent rows and columns from a single table, several tables, or may form a separate and distinct depiction (view) not associated with a physical table or tables. This virtual table is defined by the user's view. An example of each screen used to develop the application is located in Appendix K.

B. dBASE III PLUS

The dBASE series is by far the dominant data management software for the IBM PC....Beginning with the introduction of dBASE II in January 1981 (before the announcement of the PC), and continuing with dBASE III in 1984, dBASE III PLUS in 1986, and dBASE IV in 1988, Ashton-Tate has remained the unquestioned market leader. [Ref. 5]

Though potentially more powerful Standard Query Language (SQL)-based relational database management systems are commercially available, dBASE III Plus was selected for use in developing this application. There are numerous reasons for selection of this particular product, among them; the established reputation of the product as one of the industry standard programming languages for developing applications software on microcomputers, availability of after-market compiler and debugger software for the DBMS, user and programmer familiarity with the product, and program availability within many Navy commands. An important user-defined goal for application development effort is related to hardware and system requirements imposed on the user. As described in Chapter I, developer goals to satisfy user requirements included an imbedded DBMS in a compiled DIRS application capable of use on existing hardware (in the case of the U.S. Navy dental community, an IBM-compatible system with a minimum 20 megabyte hard disk). A product of this nature would not require additional off-the-shelf database software purchases.

dBASE III PLUS includes a wide range of application development tools and supports three basic user interaction

modes: assist, interactive, and programming language. [Ref. 6]

The bulk of application development work on this project was performed using dBASE III PLUS as a programming language. In this capacity, maximum flexibility for custom development is facilitated. The software development cycle followed by the dBASE programmer as defined in [Ref. 6:p. 35], is:

- Problem definition.
- Database design.
- Modular program design.
- Coding.
- Testing, debugging, and enhancing.

The similarity to the overall application development cycle is apparent, with emphasis on detailed requirements analysis prior to coding through structured programming and top-down design. Critical to goal attainment of reduced software purchases, use on existing hardware, and streamlined user training, is availability of after-market DBMS-specific program compilers. Not all DBMS products possess the facility within the program to compile developed code for conversion into DOS-executable .exe files capable of operation independent of the DBMS software. A significant market introduction delay for compiler programs exists for even the most commercially successful DBMS. Programmer familiarity and availability of Quicksilver a WordTech Systems, Inc. product, resulted in its selection as the compiler used in developing

this application, though other packages such as Clipper, a product of Nantucket, Inc., are available.

The Quicksilver compiler supports most dBASE III PLUS functions, and provides additional user defined functions such as specification of programs and files in separate drives or directories, networking commands, file-sharing capabilities, facilities for developing windows for pop-up menus and help screens, and support for environmental variables. An additional benefit derived from compiled applications is increased program execution speed for processes not "heavily disk bound" or requiring access to peripherals such as screens or printers. Each time a disk or external device must be accessed, program execution is slowed.

Compiling a custom system does not guarantee that the entire system is suddenly going to run at the speed of light. Keep in mind that a compiler basically just preinterprets your command files and stores these already interpreted commands in a separate file. It does not make the hardware operate any faster. [Ref. 6:p. 817]

While dramatic speed improvements are indeed possible, they are subject to the limitations described above. A further advantage of Quicksilver is the optional linker, allowing users to specify "the type of machine the compiled program will be run on" [Ref. 5], such as IBM PCs, 100%-compatibles, and MS-DOS machines.

C. SOFTWARE DOCUMENTATION

1. User Manual

Provisions for a detailed user manual are made in Appendix K. Written with a user perspective, including limited system development background, the user manual is intended to support users with varying computer application experience by providing detailed menu and screen format examples. A menu hierarchy is provided and followed to describe the user options available. Each figure depicted in the manual is accompanied by related text describing the menu options, selection consequence, escape procedures and any special-purpose or function key operation. No previous user familiarity with either dBASE III PLUS or Quicksilver is necessary or assumed.

2. Program Code

As previously described, all required program coding was written using the programming language function of dBASE III PLUS. The length of the program code (141 pages) precludes its incorporation as an appendix. However, in order to enable easier end-user maintenance, source code will be submitted in hard-copy under separate correspondence, and on floppy disk with the complete DIRS program for delivery to end users.

D. REPORTS

System users have a number of reporting options for both internal management and DOD-mandated submissions. Among the

available options for branch clinics are: daily, monthly and annual reports, provider statistics (stats), and major treatment reports. At Headquarter's level, in addition to the receipt of reports from respective subordinate clinics, cumulative provider stats and the monthly DIRS report are available as reporting options. An example of each report is presented in Appendix H.

V. CONCLUSIONS AND RECOMMENDATIONS

A. SUMMARY AND CONCLUSIONS

The frequency and volume of treatment data collected and stored by various Dental Treatment Facilities severely taxes manual data handling and report generating capabilities of the limited administrative staff at each facility. Critical to the success of the application is increasing the speed and accuracy of data input, thereby enhancing effectiveness and productivity of the unit, without imposing additional hardware requirements or burdening users with complex, lengthy software training procedures.

The DIRS system developed in the course of this thesis not only facilitates data entry procedures and monthly preparation of DOD-directed reports, but also supports data import/export functions from subordinate DTFs to a Headquarters command. Personnel management and reporting procedures are provided to support internal management at either subordinate DTF or Headquarters level.

As discussed in the previous chapter, dBASE III PLUS was selected to develop the DIRS application. By compiling the resulting source code through the use of Quicksilver, users need not be familiar with dBASE to understand and use the DIRS program. While "user friendliness" is a desirable attribute of any system, it is often an ill-defined and elusive goal.

In this application, emphasis on extensive menus and selection keys function as control mechanisms help guide the user through the system. Crucial to user acceptance, extensive documentation and supporting diagrams are provided in the User's Manual found in Appendix K. Additional "hands-on" experience should provide the remaining system training requirements.

B. RECOMMENDATIONS AND FUTURE WORK

The process of developing this application provided numerous "case-study" examples of the importance of correctly defining user requirements prior to initializing development work. The process was facilitated by knowledgeable users with generally well-defined and reasonably consistent structured data flows. Geographical distance between users and developers posed some difficulties, so phone conversations, mailings and personal visits to NAVDENCLINIC, Long Beach, Ca., and Director of Dental Services, San Diego, Ca., were crucial to an effective requirements definition process and user familiarization training. Developing and mailing an early prototype of DIRS to both user sites provided an exceptionally valuable mechanism to not only further clarify requirements, but also identify several previously overlooked program anomalies. Evolving user requirements and subsequent identification of additional features and modules for addition to future versions of the DIRS application developed in the scope of this thesis, provide opportunities for program

expansion either internally or within the scope of the proposed DENMIS system.

APPENDIX A
OBJECT DIAGRAMS

STATS (HQ)

| |
|----------------|
| UIC |
| COMMAND |
| MV |

COMMAND

| |
|--------------------|
| UIC |
| Name |
| MEPERS Code |
| PROVIDER |
| MV |
| YEAR |
| MV |

PROVIDER

| |
|--------------------|
| Prov Code |
| First Name |
| Last Name |
| Rank |
| Duty Status |
| DAILY |
| MV |

**TREATMENT
(DIRS CODE)**

| |
|--------------------|
| DIRS Code |
| Description |
| Comp Value |
| DAILY |
| MV |

YEAR

| |
|-----------------|
| COMMAND |
| MONTHLY |
| MV |
| Tot Yr. BCat 01 |
| Tot Yr. BCat 02 |
| Tot Yr. BCat 05 |
| Tot Yr. BCat 08 |
| Tot Yr. BCat 09 |
| Tot Yr. BCat 10 |
| Tot Yr. BCat 11 |
| Tot Yr. BCat 12 |
| Tot Yr. BCat 13 |

MONTHLY

| |
|------------------|
| COMMAND |
| DAILY |
| MV |
| Month |
| Tot Mon. BCat 01 |
| Tot Mon. BCat 02 |
| Tot Mon. BCat 05 |
| Tot Mon. BCat 08 |
| Tot Mon. BCat 09 |
| Tot Mon. BCat 10 |
| Tot Mon. BCat 11 |
| Tot Mon. BCat 12 |
| Tot Mon. BCat 13 |

DAILY

| |
|------------------|
| PROVIDER |
| TREATMENT |
| Date |
| Tot Dly. BCat 01 |
| Tot Dly. BCat 02 |
| Tot Dly. BCat 05 |
| Tot Dly. BCat 08 |
| Tot Dly. BCat 09 |
| Tot Dly. BCat 10 |
| Tot Dly. BCat 11 |
| Tot Dly. BCat 12 |
| Tot Dly. BCat 13 |

BENEFICIARY CODES:

- 01 - Active Duty, U.S. Navy
- 02 - Active Duty, U.S. Marine Corps
- 05 - Active Duty, Other Services
- 08 - Recruit, U.S. Navy or Marine Corps
- 09 - Dependents of Active Duty
U.S. Uniformed Services Personnel
- 10 - Dependents of Retired or Deceased
U.S. Uniformed Services Personnel
- 11 - Retired Uniformed Services Personnel
- 12 - Other Personnel not listed in Codes
01 through 11 and 13
- 13 - Dependent Children,
(17 & under and unmarried)

APPENDIX B

OBJECT DEFINITIONS

STATS (HQ) OBJECT

| Descriptive Name | Domain Name |
|----------------------------|-------------|
| Unit Identification Code | Clinic |
| COMMAND: . COMMAND object; | MV |

COMMAND OBJECT

| Descriptive Name | Domain Name |
|----------------------------|-------------|
| Unit Identification Code | Clinic |
| Command Name | Command |
| MEPERS Work Center Code | UCA_code |
| PROVIDER: PROVIDER object; | MV |
| YEAR: YEAR object; | MV |

PROVIDER OBJECT

| Descriptive Name | Domain Name |
|----------------------|-------------|
| Provider Code | Code |
| First Name | Fname |
| Last Name | Lname |
| Military Rank | Rank |
| Duty Status | Reserve |
| DAILY: DAILY object; | MV |

TREATMENT (DIRS CODE) OBJECT

| Descriptive Name | Domain Name |
|----------------------|-------------|
| DIRS Code | Dirs |
| Description | Descript |
| Comp Value (time) | Weight |
| DAILY: DAILY object; | MV |

YEAR OBJECT

| Descriptive Name | Domain Name |
|--|--------------------|
| Year Total to date for Beneficiary Category 01 | Tot Yr. BCat 01 |
| Year Total to date for Beneficiary Category 02 | Tot Yr. BCat 02 |
| Year Total to date for Beneficiary Category 05 | Tot Yr. BCat 05 |
| Year Total to date for Beneficiary Category 08 | Tot Yr. BCat 08 |
| Year Total to date for Beneficiary Category 09 | Tot Yr. BCat 09 |
| Year Total to date for Beneficiary Category 10 | Tot Yr. BCat 10 |
| Year Total to date for Beneficiary Category 11 | Tot Yr. BCat 11 |
| Year Total to date for Beneficiary Category 12 | Tot Yr. BCat 12 |
| COMMAND: | COMMAND object |
| MONTHLY: | MONTHLY object; MV |

MONTHLY OBJECT

| Descriptive Name | Domain Name |
|---|------------------|
| Month Total to date for Beneficiary Category 01 | Tot Mon. BCat 01 |
| Month Total to date for Beneficiary Category 02 | Tot Mon. BCat 02 |
| Month Total to date for Beneficiary Category 05 | Tot Mon. BCat 05 |
| Month Total to date for Beneficiary Category 08 | Tot Mon. BCat 08 |
| Month Total to date for Beneficiary Category 09 | Tot Mon. BCat 09 |
| Month Total to date for Beneficiary Category 10 | Tot Mon. BCat 10 |
| Month Total to date for Beneficiary Category 11 | Tot Mon. BCat 11 |
| Month Total to date for Beneficiary Category 12 | Tot Mon. BCat 12 |
| COMMAND: | COMMAND object; |
| DAILY: | DAILY object; MV |

DAILY OBJECT

| <u>Descriptive Name</u> | <u>Domain Name</u> |
|--|--------------------|
| Daily Total for Beneficiary Category 01 | Tot Dly. BCat 01 |
| Daily Total for Beneficiary Category 02 | Tot Dly. BCat 02 |
| Daily Total for Beneficiary Category 05 | Tot Dly. BCat 05 |
| Daily Total for Beneficiary Category 08 | Tot Dly. BCat 08 |
| Daily Total for Beneficiary Category 09 | Tot Dly. BCat 09 |
| Daily Total for Beneficiary Category 10 | Tot Dly. BCat 10 |
| Daily Total for Beneficiary Category 11 | Tot Dly. BCat 11 |
| Daily Total for Beneficiary Category 12 | Tot Dly. BCat 12 |
| PROVIDER: PROVIDER object | |
| TREATMENT: TREATMENT object | |

APPENDIX C

DOMAIN DEFINITIONS

CLINIC: Number(5)
This number represents the unique 5-digit Unit Identification Code (UIC) assigned to every military command. Each DTF has an individually assigned UIC, which is required on all forms submitted.

COMMAND: Character(40)
The full DTF name as listed in the NAVMEDCOMINST 6600.1B, Chapter III.

UCA_Code: Character(4)
The 4-digit MEPERS (UCA) code for each work center. The first three digits distinguish between dental clinical or laboratory procedures, while the fourth digit represents the location (work center) where the procedure was performed.

PROVCODE: Character(3)
The provider code is a three-digit code assigned to uniquely represent a dental provider at a given DTF.

FNAME: Character(20)
Dental provider's first name.

LNAME: Character(20)
Dental provider's last name.

RANK: Character(4)
Dental provider's military or civilian rank, i.e.; CAPT.

RESERVE: Character(1)
Dental provider's status. Three values can be inserted here. "C" for civilian contractor, "R" for reservist performing two weeks active duty, or "O" for other. "O" shall be the default value.

DIRS: Character(4), range: 0001 to 9999.
Actual command treatment code. Although specified as a character field, a built-in control mechanism allows only numeric values to be entered. The DIRS code identifies a specific treatment.

DESCRIPT: Character(15)
Short description (name) of a DIRS code.

WEIGHT: Number(4), Picture 999.9
Each DIRS code as a composite factor (weight) associated with it. This weight is used for computing total time spent per a requested time frame for a particular treatment.

TOT1: Number(7), picture 9999.99
The sum of all category one beneficiary code for a specific treatment and specific provider for the year multiplied by its associated weight.

TOT2: Number(7), picture 9999.99
The sum of all category two beneficiary code for a specific treatment and specific provider for the year multiplied by its associated weight.

TOT5: Number(7), picture 9999.99
The sum of all category five beneficiary code for a specific treatment and specific provider for the year multiplied by its associated weight.

TOT8: Number(7), picture 9999.99
The sum of all category eight beneficiary code for a specific treatment and specific provider for the year multiplied by its associated weight.

TOT9: Number(7), picture 9999.99
The sum of all category nine beneficiary code for a specific treatment and specific provider for the year multiplied by its associated weight.

TOT10: Number(7), picture 9999.99
The sum of all category ten beneficiary code for a specific treatment and specific provider for the year multiplied by its associated weight.

TOT11: Number(7), picture 9999.99
The sum of all category eleven beneficiary code for a specific treatment and specific provider for the year multiplied by its associated weight.

TOT12: Number(7), picture 9999.99
The sum of all category twelve beneficiary code for a specific treatment and specific provider for the year multiplied by its associated weight.

TOT13: Number(7), picture 9999.99
The sum of all category thirteen beneficiary code for a specific treatment and specific provider for the year multiplied by its associated weight.

M_tot1: Number(5), Picture 99999
Total number of treatment provided for a specific treatment by a specific provider for beneficiary code 1. A cumulative count of D_tot1 domain for the user's open month selection.

M_tot2: Number(5), Picture 99999
Total number of treatment provided for a specific treatment by a specific provider for beneficiary code 2. A cumulative count of D_tot2 domain for the user's open month selection.

M_tot5: Number(5), Picture 99999
Total number of treatment provided for a specific treatment by a specific provider for beneficiary code 5. A cumulative count of D_tot5 domain for the user's open month selection.

M_tot8: Number(5), Picture 99999
Total number of treatment provided for a specific treatment by a specific provider for beneficiary code 8. A cumulative count of D_tot8 domain for the user's open month selection.

M_tot9: Number(5), Picture 99999
Total number of treatment provided for a specific treatment by a specific provider for beneficiary code 9. A cumulative count of D_tot9 domain for the user's open month selection.

M_tot10: Number(5), Picture 99999
Total number of treatment provided for a specific treatment by a specific provider for beneficiary code 10. A cumulative count of D_tot10 domain for the user's open month selection.

M_tot11: Number(5), Picture 99999
Total number of treatment provided for a specific treatment by a specific provider for beneficiary code 11. A cumulative count of D_tot11 domain for the user's open month selection.

M_tot12: Number(5), Picture 99999
Total number of treatment provided for a specific treatment by a specific provider for beneficiary code 12. A cumulative count of D_tot12 domain for the user's open month selection.

M_tot13: Number(5), Picture 99999
Total number of treatment provided for a specific treatment by a specific provider for beneficiary code 13. A cumulative count of D_tot13 domain for the user's open month selection.

D_TOT1: Number(5), Picture 99999
Total number of treatment provided for a specific treatment by a specific provider for beneficiary code 1.

D_TOT2: Number(5), Picture 99999
Total number of treatment provided for a specific treatment by a specific provider for beneficiary code 2.

D_TOT5: Number(5), Picture 99999
Total number of treatment provided for a specific treatment by a specific provider for beneficiary code 5.

D_TOT8: Number(5), Picture 99999
Total number of treatment provided for a specific treatment by a specific provider for beneficiary code 8.

D_TOT9: Number(5), Picture 99999
Total number of treatment provided for a specific treatment by a specific provider for beneficiary code 9.

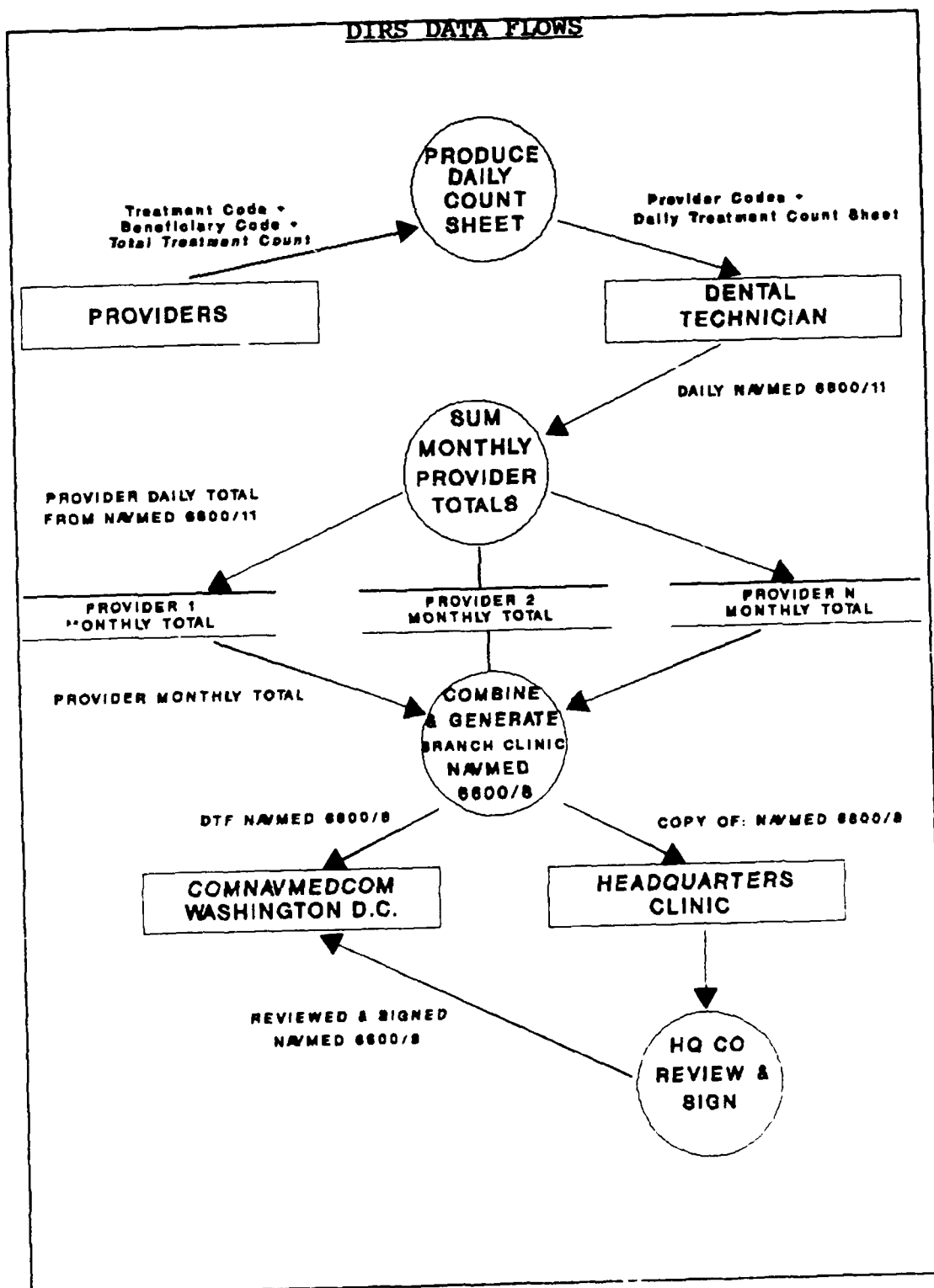
D_TOT10: Number(5), Picture 99999
Total number of treatment provided for a specific treatment by a specific provider for beneficiary code 10.

D_TOT11: Number(5), Picture 99999
Total number of treatment provided for a specific treatment by a specific provider for beneficiary code 11.

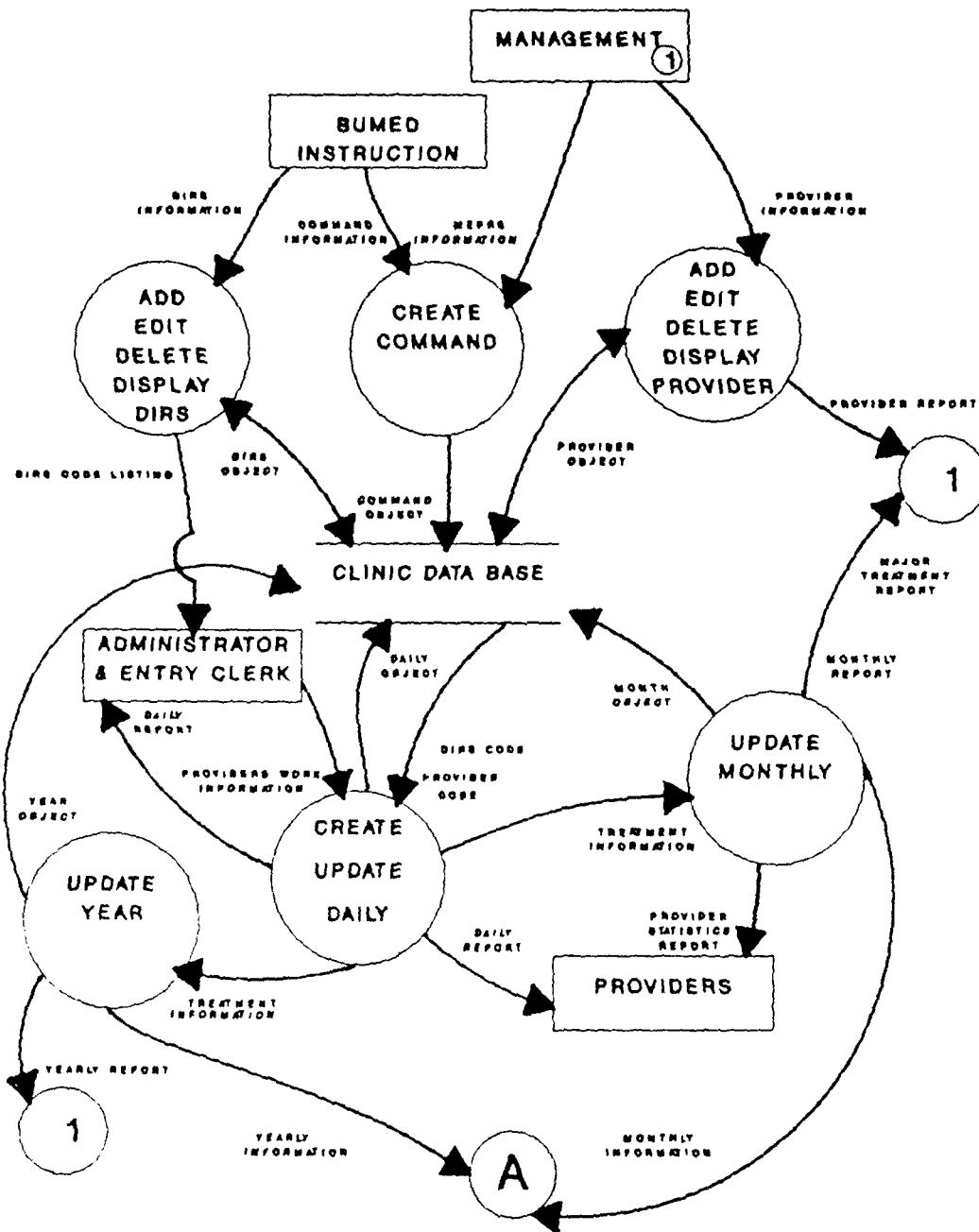
D_TOT12: Number(5), Picture 99999
Total number of treatment provided for a specific treatment by a specific provider for beneficiary code 12.

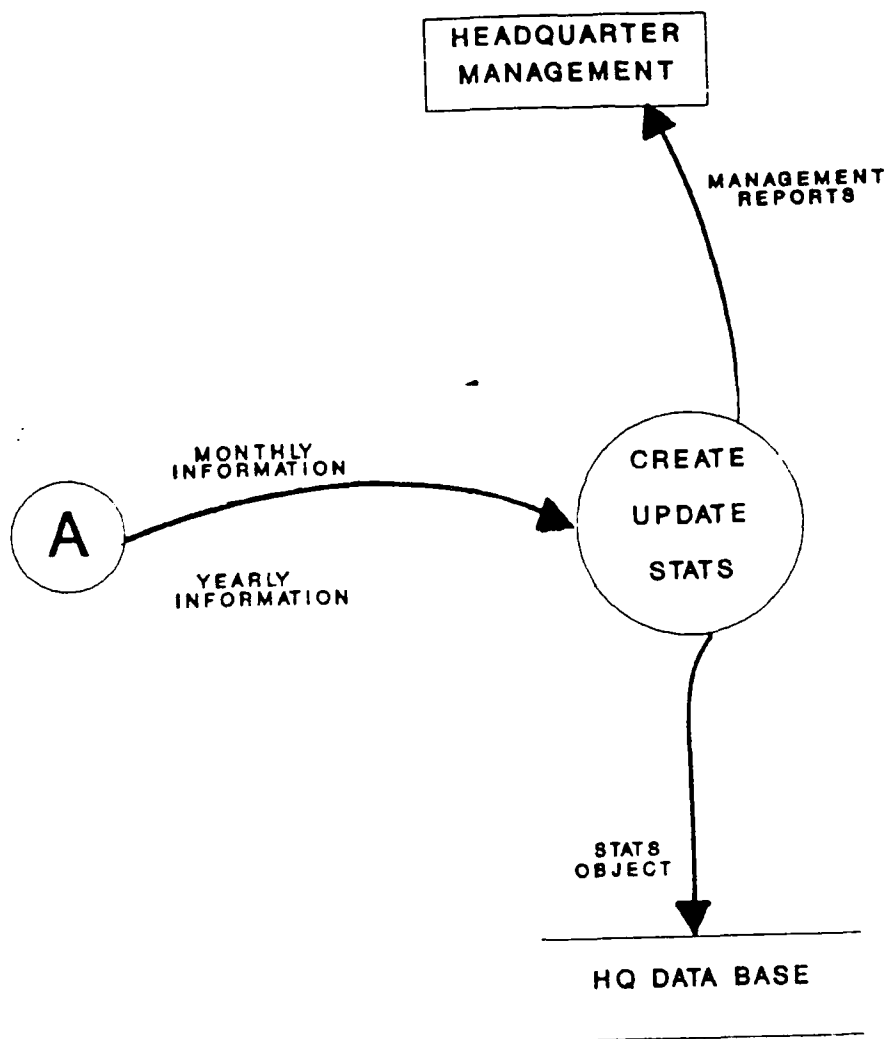
D_TOT13: Number(5), Picture 99999
Total number of treatment provided for a specific
treatment by a specific provider for beneficiary
code 13.

APPENDIX D
DATA FLOW DIAGRAMS



DATA FLOW DIAGRAM





APPENDIX E

UPDATE, DISPLAY AND CONTROL MECHANISMS

PROVIDER OBJECT Update Mechanisms

I. Create PROVIDER

- A. Input Description
 - Provider code assigned by database administrator
 - Provider name (last and first name)
 - Rank or rate
 - Status code (R = reservist, C = contracted personnel,
O = others that are not R or C)
- B. Output Description
 - New PROVIDER object
- C. Processing Notes
 - System shall check to ensure that no two providers have the same provider code
- D. Volume
 - Approximately six to ten providers per dental clinic
 - Volume is dependent on the size of command
- E. Frequency
 - Created when a new provider checks onboard

II. Modify PROVIDER

- A. Input Description
 - Correction to provider listing
 - PROVIDER object
- B. Output Description
 - Modified PROVIDER object
 - Confirmation message while updating on screen
- C. Processing Notes
 - System shall not allow user to modify key field (provider code)

- D. Volume
 - One record correction per quarter
- E. Frequency
 - One record correction per quarter

III. Delete PROVIDER

- A. Input Description
 - Transferred personnel report
 - PROVIDER object
- B. Output Description
 - updated PROVIDER object
 - Confirmation message to delete record on screen
- C. Processing Notes
 - Record is displayed for confirmation. User must respond affirmatively to the prompt to delete record
- D. Volume
 - Varies with the number of transfers
- E. Frequency
 - Varies with the number of transfers

PROVIDER OBJECT Display Mechanisms

I. PROVIDER listing

- A. Output Description
 - Form showing provider code, first and last name, rank and status code (R, C, O)
- B. Source data
 - PROVIDER object
- C. Processing Notes
 - Produce weekly by database administrator
- D. Volume
 - One report per week
- E. Frequency
 - One report per week

PROVIDER OBJECT
Control Mechanisms

- I. Pop-up windows, system validation routines, along with user prompts

TREATMENT OBJECT
Update Mechanisms

- I. Create TREATMENT
 - A. Input Description
 - DIRS treatment codes, description, and Critical Time Value (CTV) are specified in NAVMEDCOMINST 6600.1B
 - New code created by Bureau of Medicine (BUDMED)
 - B. Output Description
 - New TREATMENT object
 - C. Processing Notes
 - System shall ensure that each treatment code is unique
 - This table will be created for the user
 - D. Volume
 - Approximately three hundred codes
 - E. Frequency
 - Once at system development
- II. Modify TREATMENT
 - A. Input Description
 - Correction to initial entries made during system implementation
 - Changes made to NAVMEDCOMINST 6600.1B
 - B. Output Description
 - Modified TREATMENT object
 - Confirmation message while updating on screen
 - C. Processing Notes
 - System shall not allow user to modify key field (treatment code)
 - D. Volume
 - Extremely low

- E. Frequency
 - Approximately once every two years some of the treatment codes may change or its CTV will change. These changes are determined at an echelon 2 command level not at an echelon 3 or 4 command where this system is designed for use

III. Delete TREATMENT

- A. Input Description
 - Invalid treatment code entered during creation
 - Outdated treatment codes that have been deleted in NAVMEDCOMINST 6600.1B
- B. Output Description
 - Updated TREATMENT object
 - Confirmation message while updating on screen
- C. Processing Notes
 - System shall allow user verification to modify key
 - Confirmation message to delete record on screen
- D. Volume
 - Extremely low
- E. Frequency
 - Approximately once every two year some of the treatment codes may change or its CTV will change. These changes are determined at an echelon 2 command level not at an echelon 3 or 4 command where this system is designed for use

TREATMENT OBJECT Display Mechanisms

- I. TREATMENT listing
 - A. Output Description
 - Form showing treatment (DIRS) code, description, CTV (weight)
 - B. Source data
 - TREATMENT object
 - C. Processing Notes
 - This object is used for treatment code validation while updating the DAILY, MONTHLY, and YEARLY object

- D. Volume
 - One report to verify any updates
- E. Frequency
 - One per year

TREATMENT OBJECT
Control Mechanisms

- I. Pop-up windows, system validation routines, along with user prompts

DAILY OBJECT
Update Mechanisms

- I. Create Daily
 - A. Input Description
 - Month selection (from menu selection options)
 - Provider selection (from provider object)
 - Treatment code selection (from treatment object)
 - Manual data entry of totals for each beneficiary (category) code treated (from daily providers' work sheet)
 - B. Output Description
 - New DAILY object in database
 - Updated MONTHLY object in database
 - Updated YEARLY object in database
 - Confirmation message of updates on screen
 - Online monthly and yearly totals for selected treatment and individual provider on screen
 - On demand Hardcopy availability of input data for the data entry session
 - C. Processing Notes
 - The DAILY object is initialized with each session, therefore the Daily report will only reflect information keyed in during the current session
 - D. Volume
 - Average number of different treatments per provider is 26 treatments per day. Each clinic averages six providers per work-day (Monday through Friday)

- E. Frequency
 - Once per day or one per session (when data is entered). Users have specified that data is entered at minimum once per week
 - Minimum one per week

II. Modify DAILY data

- A. Input Description
 - Changes or errors noted on daily providers' work sheet)
 - Data entry errors not corrected at initial entry need to be corrected
 - Procedure same as with create DAILY except that negative or positive values are entered to correctly adjust the monthly and yearly totals for a requested provider, treatment and month
- B. Output Description
 - Modified DAILY object in database
 - Modified MONTHLY object in database
 - Updated YEARLY object in database
 - Confirmation message of updates on screen
 - Online monthly and yearly totals for selected treatment and individual provider on screen
 - On demand Hardcopy availability of input data for the modification data entry session
- C. Processing Notes
 - The DAILY object is initialized with each new data entry session, therefore the Daily report will only reflect information keyed in during this session
- D. Volume
 - One day per month, ten treatments
- E. Frequency
 - As needed
 - Modification are generally only needed due to erroneous data entry. Since control mechanisms are built into the system, prompting data entry personnel to validate entry before entry is accepted into the database, these type of errors are infrequent

III. Delete DAILY data

A. Input Description

- Procedure same as with create DAILY except that negative values are entered to correctly adjust the monthly and yearly totals for a requested provider, treatment and month
- The DAILY object is deleted automatically when the system is executed for the first time during the day. A new DAILY object reflecting the new transaction is then generated

B. Output Description

- Modified DAILY object in database reflecting deleted transactions
- Updated MONTHLY object in database
- Updated YEARLY object in database
- Confirmation message of updates on screen
- Online monthly and yearly totals for selected treatment and individual provider on screen
- On demand Hardcopy availability of input data for the modification data entry session

C. Processing Notes

- The DAILY object is initialized with each new data entry session. Therefore the Daily report will only reflect information keyed in during this session

D. Volume

- One to two records per entry session

E. Frequency

- As required

DAILY OBJECT Display Mechanisms

I. Daily Report

A. Output Description

- Form showing by beneficiary codes, and all treatments, performed by each provider. The report shall total the number of treatments for a single treatment code with its associated composite time value total (CTV) (weighted time) total number treatment performed times its CTV) for all active Navy and retired personnel. The form shall also give a one-line summary of the work performed for each provider. A new page is

used for every provider. The command daily summary shall also be printed on a separate sheet in the same prestatd format. See Appendix K for an example of the daily summary

- B. Source data
 - DAILY object
- C. Processing Notes
 - Daily object contains PROVIDER, TREATMENT object data
 - Use at local command and distributed to each provider for accuracy validation
- D. Volume
 - One for entry clerk
 - One copy for each provider
 - One copy to the administration officer
- E. Frequency
 - One daily or one per data entry session

DAILY OBJECT
Control Mechanisms

- I. Pull-down menus, pop-up windows, system validation routines, along with user prompts

MONTHLY OBJECT
Update Mechanisms

- I. Create Monthly
 - A. Input Description
 - DAILY object automatically updates the MONTHLY object for the selected month
 - B. Output Description
 - Updated MONTHLY object in database
 - Updated YEARLY object in database
 - Online monthly and yearly totals for selected treatment and individual provider on screen
 - On demand Hardcopy availability of work performed by provider for a selected month
 - C. Processing Notes
 - The DAILY object is initialized with each new session. Therefore the Daily report will

only reflect information keyed in during the data entry sitting

D. Volume

- Average number of different treatments per provider is 26 treatments per day times the number of work days per month. Each clinic averages six providers per work-day (Monday through Friday)

E. Frequency

- Since DAILY object automatically updates the MONTHLY object the frequency is the same as for the DAILY object update
- Minimum one per week

II. Modify MONTHLY data

A. Input Description

- Changes or errors noted on daily providers' work sheet
- Data entry errors not corrected at initial entry need to be corrected
- Procedure same as with create DAILY except that negative or positive values are entered to correctly adjust the monthly and yearly totals for a requested provider, treatment and month

B. Output Description

- Modified DAILY object in database
- Modified MONTHLY object in database
- Updated YEAR object in database
- Confirmation message of updates on screen
- Online monthly and yearly totals for selected treatment and individual provider on screen
- On demand Hardcopy availability of input data for the modification data entry session

C. Processing Notes

- The MONTHLY object is modified via the update daily mechanism which updates the DAILY object as well as the MONTHLY

D. Volume

- Number of treatments is dependent on the number of incorrect daily entries made during a given month. Errors are generally corrected via the validated daily provider's report which is returned to the DIRS data entry clerk
- Low

- E. Frequency
 - As required
 - Modification are generally only needed due to erroneous data entry. Since control mechanism are built in the system which prompt data entry personnel to validate entry before entry is accepted into the database, these type of errors are infrequent

III. Delete MONTHLY data

- A. Input Description
 - Procedure same as with update DAILY except that negative values are entered to correctly adjust the monthly and yearly totals for a requested provider, treatment and month
 - The MONTHLY object is deleted through the utilities option by selecting the start new year option
- B. Output Description
 - New database structure created for MONTHLY object when a new year is started
 - Updated MONTHLY object in database
 - Updated YEAR object in database
 - Confirmation message of updates on screen
 - Online monthly and yearly totals for selected treatment and individual provider on screen
 - On demand Hardcopy availability of input data for the modification data entry session
- C. Processing Notes
 - MONTHLY object is automatically updated via the update daily module
- D. Volume
 - Low
- E. Frequency
 - MONTHLY object is deleted once per year

MONTHLY OBJECT
Display Mechanisms

I. Monthly Report

A. Output Description

- Same as with Daily object report except that information represents monthly figures versus daily totals
- Providers' statistical report used by management displays provider code, total number of treatments, total CTV, and cumulative command totals for the selected month. Headquarters may also produce similar report provided information has been imported from subordinate commands
- Major treatment report allowing user to narrow its scope of information by the selection of up to ten critical treatment codes. List providers along with treatment codes, total number of treatments and total CTV

B. Source data

- Selected MONTHLY object
- May be selected any time during the year for a requested month

C. Processing Notes

- MONTHLY object contains COMMAND and DAILY object data
- Use at local command and distributed to each provider as a feeder sheet on individual productivity
- Headquarter maintains an aggregated MONTHLY object of all its subordinate command to produce an OCR monthly report for submission to NAVBUMED, Washington D.C.
- The major treatment report is used by management for internal management of provider productivity
- A monthly report similar in format to the monthly OCR DIRS report produced by HQ. Report is not OCR font
- A providers statistics report is produced displaying information by provider versus by treatment as in the case of monthly reports

D. Volume

- Minimum three per month
- Any time during a month for an up-to-date report

- E. Frequency
 - Monthly

MONTHLY OBJECT
Control Mechanisms

- I. Pull-down menus, pop-up windows, system validation routines, along with user prompts provide suitable control mechanisms

YEAR OBJECT
Update Mechanisms

- I. Create YEAR
 - A. Input Description
 - DAILY object automatically updates the YEAR 6 object
 - B. Output Description
 - Updated MONTHLY object in database
 - Updated YEARLY object in database
 - Online yearly totals for selected treatment and individual provider on screen
 - C. Processing Notes
 - The YEAR object is created at the start of a new year. The DAILY object is the feeder for the YEAR OBJECT
 - D. Volume
 - Average number of different treatments per provider is 26 treatments per day times the number of work days per year. Each clinic averages six providers per work-day (Monday through Friday)
 - E. Frequency
 - As often as the DAILY object is updated
- II. Modify YEAR data
 - A. Input Description
 - Same as with DAILY and MONTHLY object

- B. Output Description
 - Modified YEAR object in database
 - Confirmation message of updates on screen
 - Online yearly totals for selected treatment and individual provider on screen
- C. Processing Notes
 - The YEAR object is modified via the update daily mechanism which updates the DAILY object as well as the MONTHLY and YEARLY OBJECT database automatically
- D. Volume
 - Very low since data has generally been corrected by the DAILY and MONTHLY object update mechanisms
 - Same as per DAILY object
- E. Frequency
 - Same as per DAILY object

III. Delete YEAR data

- A. Input Description
 - Procedure same as with update DAILY except that negative values are entered to correctly adjust the yearly totals for a requested provider, treatment and month
 - The YEAR object is deleted through the utilities option by selecting the start new year option
- B. Output Description
 - New database structure created for the YEAR object when a new year is started
 - Updated YEAR object in database
 - Confirmation message of updates on screen
 - Online yearly totals for selected treatment and individual provider on screen
- C. Processing Notes
 - YEAR object is automatically updated via the update DAILY object mechanism
- D. Volume
 - Very low
- E. Frequency
 - YEAR object is deleted once per year

YEAR OBJECT
Display Mechanisms

I. Annual Report

A. Output Description

- Same as with Monthly report except that information represents the total number of treatment to date for the given year

B. Source data

- Selected YEAR object

C. Processing Notes

- YEAR object contains COMMAND and MONTHLY object data
- Use at local command and distributed to each provider as a feeder sheet on individual productivity
- Use by management for planning and budgeting function
- Use by management as a verification tools against the aggregated monthly reports
- A providers statistics report is produced displaying information by provider versus by treatment as in the case of a monthly report

D. Volume

- One per month
- One per year
- Any time during the year

E. Frequency

- Monthly
- Yearly

YEAR OBJECT
Control Mechanisms

- I. Pull-down menus, pop-up windows, system validation routines, along with user prompts provide suitable control mechanisms

COMMAND OBJECT
Update Mechanisms

NOTE: This object is different from typical objects as it is used solely as a control mechanism to provide users a more intuitive, less repetitious system.

I. Create COMMAND object

- A. Input Description
 - Unit Identification Code (UIC)
 - Command name
 - MEPEERS codes for laboratory and clinical procedures
- B. Output Description
 - New COMMAND object
 - Confirmation message of updates on screen
- C. Processing Notes
 - This information generally does not change.
 - DIRS is designed to support one to nine dental clinics
- D. Volume
 - One to nine clinics
- E. Frequency
 - Once at initial installation

II. Delete or Modify COMMAND Object

- A. Input Description
 - Same as with create COMMAND object
 - At DOS prompt file "comm.mem" is deleted
- B. Output Description
 - New COMMAND object
- C. Processing Notes
 - This information generally does not change
 - DIRS is designed to support one to nine dental clinics
- D. Volume
 - Not applicable
- E. Frequency
 - Not applicable

COMMAND OBJECT
Display Mechanisms

- I. Pop-up windows
 - A. Output Description
 - Help screens displaying and prompting user for command or MEPERS selection
 - B. Source data
 - COMMAND object (alias comm.mem)
 - C. Processing Notes
 - Mainly used at headquarter (HQ) level where user must differentiate between commands
 - D. Volume
 - Anytime HQ wishes to print report on a particular clinic
 - E. Frequency
 - Varies from command to command

COMMAND OBJECT
Control Mechanisms

- I. Pull-down menus, pop-up windows, system validation routines, along with user prompts
- II. Automatic UIC entry
 - A. Output Description
 - Automatically enters command UIC to file that will be exported to HQ
 - B. Source Data
 - COMMAND object
 - C. Processing Notes
 - User never has to key-in command information for updating DAILY, MONTHLY, or YEARLY object thus avoiding possible data validity and data entry errors
 - D. Volume
 - Same as with DAILY object update mechanisms

- E. Frequency
 - Daily

STATS OBJECT
Update Mechanisms

I. Create STATS

- A. Input Description
 - An aggregate of all data segregated by month for an entire year on all subordinate commands
 - This object is only maintained at HQ
 - Created by importing subordinate command MONTHLY object
- B. Output Description
 - Updated STATS object at HQ
- C. Processing Notes
 - This object is the major feeder for all reports that are generated by HQ
- D. Volume
 - MONTHLY object for each subordinate clinic
 - Approximately 156 records per clinic
- E. Frequency
 - Created once per Year

II. Modify STATS data

- A. Input Description
 - Monthly Import file from subordinate command
- B. Output Description
 - Updated STATS object at HQ
- C. Processing Notes
 - Automatically modified with import of subordinate command
- D. Volume
 - One to two records per month per clinic
- E. Frequency
 - Once per month

III. Delete STATS data

- A. Input Description
 - Monthly Import file from subordinate command
- B. Output Description
 - Updated STATS object at HQ
- C. Processing Notes
 - Automatically modified with import of subordinate command
 - The entire object shall be delete once per year via menu selection
- D. Volume
 - Not applicable since extra treatments are not added. Total number of treatments for an individual provider and treatment are sometimes modified but not deleted
- E. Frequency
 - Not applicable

STATS OBJECT Display Mechanisms

I. Monthly OCR Report and Providers Stats Report

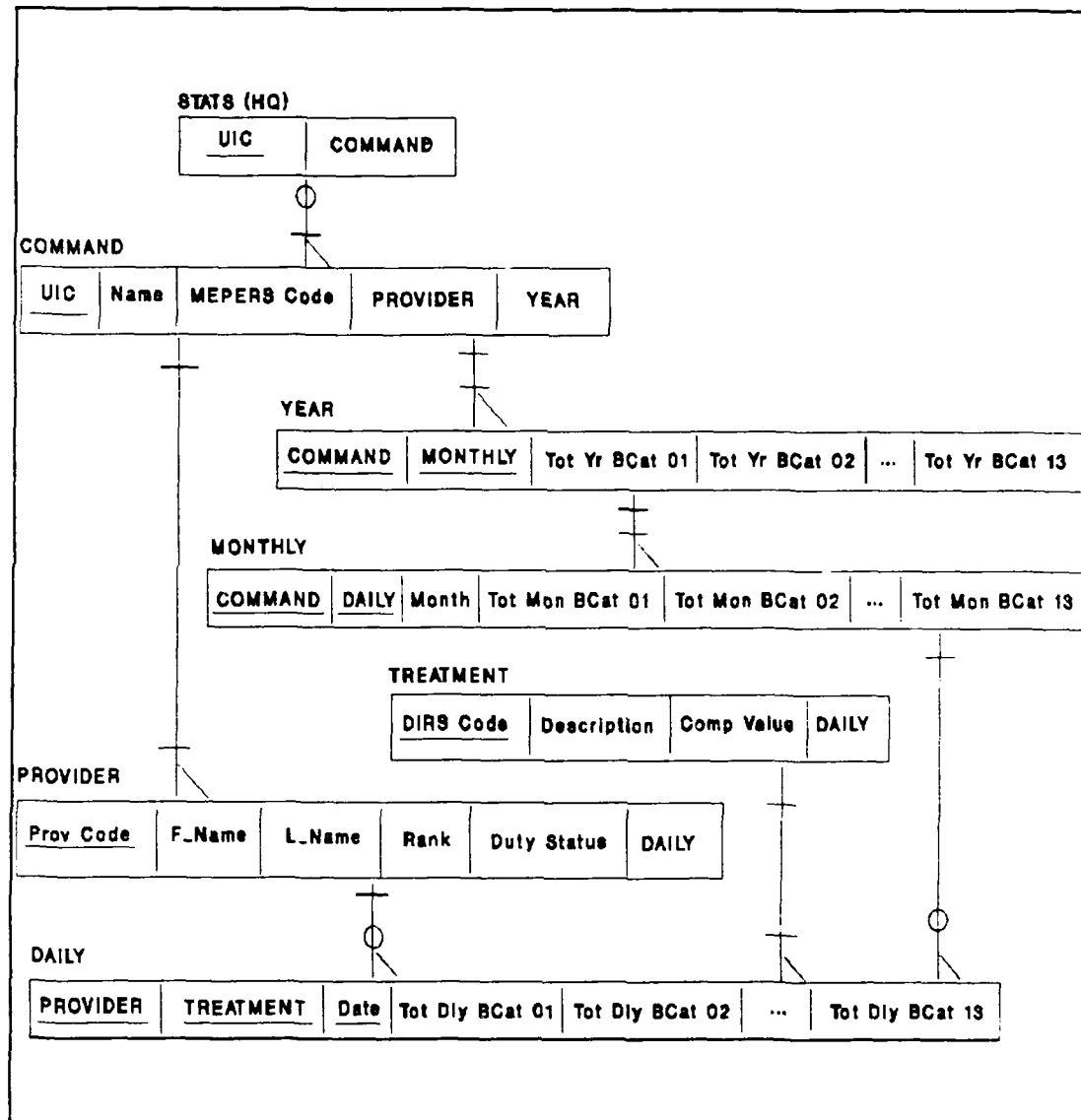
- A. Output Description
 - An OCR form for a selected clinic and month which must be printed on an OCR printer
 - A providers statistics report is identical to MONTHLY display mechanism except that it shall display all providers productivity within chain-of-command of HQ
- B. Source data
 - Selected STATS and COMMAND objects
- C. Processing Notes
 - STATS object contains COMMAND object data
 - Use by management for planning and budgeting function
- D. Volume
 - As many OCR reports as subordinate clinics
 - Stats report is produced at minimum one per month

- E. Frequency
- Monthly
 - Yearly

STATS OBJECT
Control Mechanisms

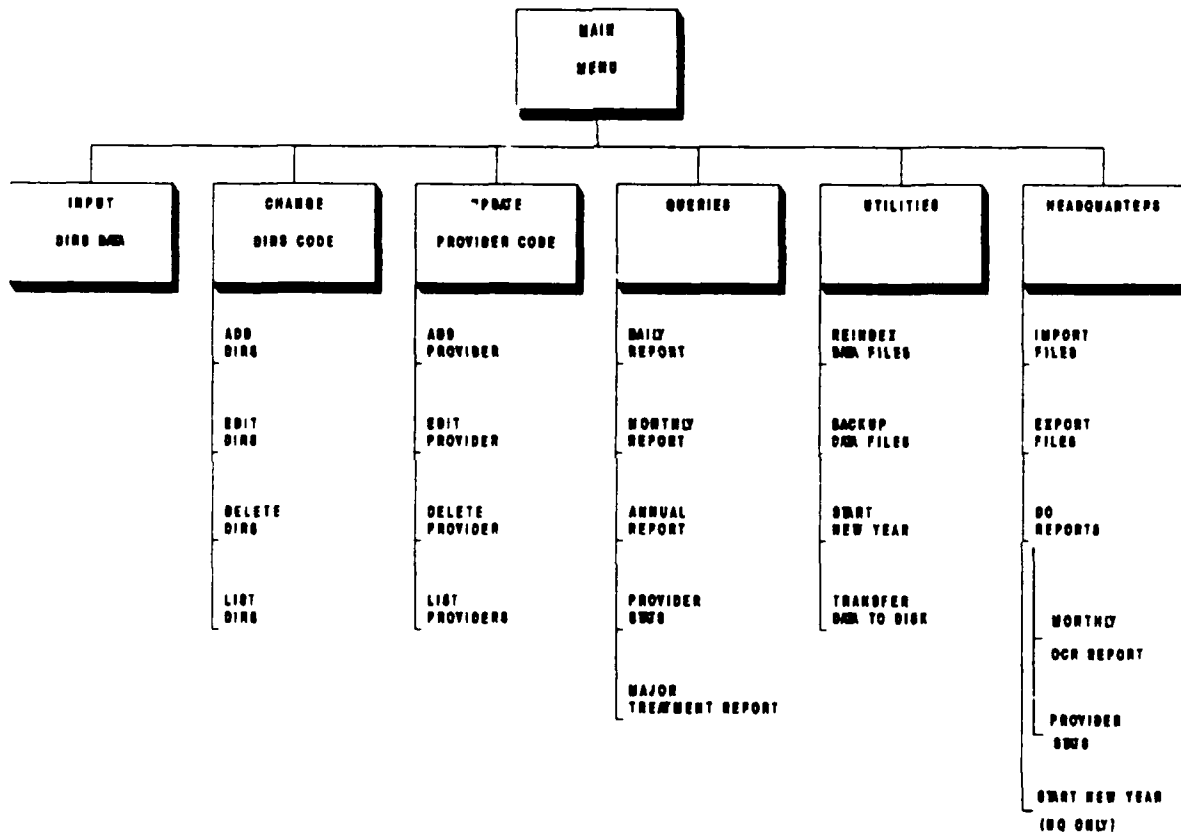
- I. Pull-down menus, pop-up windows, system validation routines, along with user prompts. A database administrator will be assigned at HQ to manage overall system data integrity

APPENDIX F
RELATION DIAGRAM



APPENDIX G
LOGICAL MENU STRUCTURE

MENU HIERARCHY



APPENDIX H

SAMPLE REPORTS

NAVAL DENTAL CLINIC, LONG BEACH, CA. 12:49:38 01/13/90
DENTAL INFORMATION RETRIEVAL SYSTEM SCREEN # 1.4

REPORT MENU

DAILY REPORT
MONTHLY REPORT
ANNUAL REPORT
PROVIDERS STATS.
MAJOR TREATMENT REPORT

RETURN TO MAIN MENU

USE UP AND DOWN CURSOR KEYS ↑↓ TO HIGHLIGHT ITEM AND
PRESS<RETURN>

Branch Clinic Report Menu

Documents on the following pages of this appendix depict sample reports produced after selection of menu options presented from the DIRS Branch Clinic Report Menu screen reproduced above.

02/05/90
PAGE 1

DENTAL INFORMATION RETRIEVAL SYSTEM
DAILY INPUT REPORT

PROVIDER: 117

| 01 | 02 | 05 | BENEFICIARY CATEGORY | | | | 12 | 13 | TOTAL | CTV TOTAL | CTV NAVY | CTV RETIRED |
|----------------------------|-----|-----|----------------------|------|------|------|-----|-----|-------|--------------|-------------|----------------|
| 08 | 09 | 10 | 11 | | | | | | | | | |
| ** TREATMENT CODE: 0001 ** | | | | | | | | | | | | |
| 5.0 | 0.0 | 2.0 | 3.0 | 22.0 | 33.0 | 0.0 | 0.0 | 1.0 | 66.0 | 132.0 | 10.0 | 0.0 |
| ** TREATMENT CODE: 5752 ** | | | | | | | | | | | | |
| 3.0 | 0.0 | 0.0 | 3.0 | 34.0 | 0.0 | 33.0 | 0.0 | 9.0 | 82.0 | 344.4 | 12.6 | 138.6 |

PROVIDER TOTALS

| 01 | 02 | 05 | BENEFICIARY CATEGORY | | | | 12 | 13 | TOTAL | CTV TOTAL | CTV NAVY | CTV RETIRED |
|-----|-----|-----|----------------------|------|------|------|-----|------|-------|--------------|-------------|----------------|
| 08 | 09 | 10 | 11 | | | | | | | | | |
| 8.0 | 0.0 | 2.0 | 6.0 | 56.0 | 33.0 | 33.0 | 0.0 | 10.0 | 148.0 | 476.4 | 22.6 | 138.6 |

02/05/90
PAGE 2

DENTAL INFORMATION RETRIEVAL SYSTEM
DAILY INPUT REPORT

TOTALS FOR TODAY

| | | | BENEFICIARY CATEGORY | | | | | | | CTV | CTV | CTV |
|-----|-----|-----|----------------------|------|------|------|-----|------|-------|-------|------|---------|
| 01 | 02 | 05 | 08 | 09 | 10 | 11 | 12 | 13 | TOTAL | TOTAL | NAVY | RETIRED |
| 8.0 | 0.0 | 2.0 | 6.0 | 56.0 | 33.0 | 33.0 | 0.0 | 10.0 | 148.0 | 476.4 | 22.6 | 138.6 |

Page No. 1
02/05/90

DENTAL INFORMATION
RETRIEVAL SYSTEM
TREATMENT REPORT
FOR THE MONTH OF JUNE

| | CT01 | CT02 | CT05 | CT08 | CT09 | CT10 | CT11 | CT12 | CT13 | TOTAL | CTV TOTAL | CTV NAVY | CTV RET. |
|----------------|------|------|------|------|------|------|------|------|------|-------|--------------|-------------|-------------|
| ** DIRS 0001 | | | | | | | | | | | | | |
| ** Subtotal ** | | | | | | | | | | | | | |
| 36 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 36 | 72.0 | 72.0 | 0.0 |
| ** DIRS 0002 | | | | | | | | | | | | | |
| ** Subtotal ** | | | | | | | | | | | | | |
| 7 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 7 | 28.0 | 28.0 | 0.0 |
| ** DIRS 0003 | | | | | | | | | | | | | |
| ** Subtotal ** | | | | | | | | | | | | | |
| 5 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 5 | 25.0 | 25.0 | 0.0 |
| ** DIRS 0004 | | | | | | | | | | | | | |
| ** Subtotal ** | | | | | | | | | | | | | |
| 12 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 12 | 48.0 | 48.0 | 0.0 |
| ** DIRS 0005 | | | | | | | | | | | | | |
| ** Subtotal ** | | | | | | | | | | | | | |
| 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 5.0 | 5.0 | 0.0 |
| ** DIRS 0006 | | | | | | | | | | | | | |
| ** Subtotal ** | | | | | | | | | | | | | |
| 26 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 26 | 26.0 | 26.0 | 0.0 |
| ** DIRS 0007 | | | | | | | | | | | | | |
| ** Subtotal ** | | | | | | | | | | | | | |
| 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 2.0 | 2.0 | 0.0 |
| ** DIRS 0010 | | | | | | | | | | | | | |
| ** Subtotal ** | | | | | | | | | | | | | |
| 18 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 18 | 90.0 | 90.0 | 0.0 |
| ** DIRS 0011 | | | | | | | | | | | | | |
| ** Subtotal ** | | | | | | | | | | | | | |
| 37 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 37 | 74.0 | 74.0 | 0.0 |

Page No. 11
02/05/90

DENTAL INFORMATION
RETRIEVAL SYSTEM
TREATMENT REPORT
FOR THE MONTH OF JUNE

| | CT01 | CT02 | CT05 | CT08 | CT09 | CT10 | CT11 | CT12 | CT13 | TOTAL | CTV TOTAL | CTV NAVY | CTV RET. |
|----------------|------|------|------|------|------|------|------|------|------|-------|--------------|-------------|-------------|
| ** DIRS 9918 | | | | | | | | | | | | | |
| ** Subtotal ** | | | | | | | | | | | | | |
| 38 | 0 | 1 | 0 | 0 | 0 | 0 | 4 | 0 | 0 | 43 | 21.5 | 19.0 | 2.0 |
| ** DIRS 9923 | | | | | | | | | | | | | |
| ** Subtotal ** | | | | | | | | | | | | | |
| 27 | 1 | 6 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 36 | 28.8 | 21.6 | 0.8 |
| ** DIRS 9972 | | | | | | | | | | | | | |
| ** Subtotal ** | | | | | | | | | | | | | |
| 512 | 4 | 17 | 0 | 20 | 4 | 20 | 6 | 6 | 6 | 589 | 471.2 | 409.6 | 16.0 |
| ** DIRS 9973 | | | | | | | | | | | | | |
| ** Subtotal ** | | | | | | | | | | | | | |
| 346 | 0 | 17 | 0 | 8 | 8 | 23 | 3 | 0 | 0 | 405 | 445.5 | 380.6 | 25.3 |
| *** Total *** | | | | | | | | | | | | | |
| 5583 | 21 | 200 | 1 | 121 | 56 | 231 | 30 | 22 | 22 | 6265 | 5221.8 | 4721.3 | 153.6 |

Page No. 11
02/24/90

DENTAL INFORMATION
RETRIEVAL SYSTEM
YEARLY TREATMENT REPORT

| CT01 | CT02 | CT05 | CT08 | CT09 | CT10 | CT11 | CT12 | CT13 | TOTAL | CTV TOTAL | CTV NAVY | CTV RET. |
|----------------|------|------|------|------|------|------|------|------|-------|--------------|-------------|-------------|
| ** DIRS 9918 | | | | | | | | | | | | |
| ** Subtotal ** | | | | | | | | | | | | |
| 195 | 1 | 7 | 0 | 2 | 0 | 25 | 1 | 2 | 233 | 116.5 | 97.5 | 12.5 |
| ** DIRS 9923 | | | | | | | | | | | | |
| ** Subtotal ** | | | | | | | | | | | | |
| 255 | 4 | 21 | 0 | 0 | 1 | 3 | 0 | 0 | 284 | 227.2 | 204.0 | 2.4 |
| ** DIRS 9972 | | | | | | | | | | | | |
| ** Subtotal ** | | | | | | | | | | | | |
| 3769 | 89 | 121 | 0 | 136 | 11 | 270 | 93 | 79 | 4568 | 3654.4 | 3015.2 | 216.0 |
| ** DIRS 9973 | | | | | | | | | | | | |
| ** Subtotal ** | | | | | | | | | | | | |
| 2222 | 16 | 94 | 0 | 45 | 12 | 169 | 8 | 8 | 2574 | 2831.4 | 2444.2 | 185.9 |
| *** Total *** | | | | | | | | | | | | |
| 40459 | 532 | 1297 | 2 | 793 | 124 | 2329 | 432 | 357 | 46325 | 34610.7 | 31066.5 | 1358.0 |

NAVAL POSTGRADUATE SCHOOL, MONTEREY, CA.
Page No: 1

PROVIDER SUMMARY REPORT
FOR THE MONTH OF JUN 1990

| PROVIDER CODE | TOTAL TREATMENT | TOTAL VALUE |
|---------------|-----------------|-------------|
| 112 | 45 | 25.3 |
| 113 | 841 | 602.6 |
| 114 | 525 | 356.0 |
| 117 | 1085 | 759.2 |
| 119 | 756 | 436.7 |
| 126 | 532 | 349.9 |
| 131 | 1127 | 811.8 |
| 132 | 351 | 182.8 |
| 133 | 210 | 1098.0 |
| 425 | 793 | 599.5 |

| | | |
|--------------------|------|--------|
| CUMULATIVE TOTALS: | 6265 | 5221.8 |
|--------------------|------|--------|

MAJOR TREATMENT REPORT
FOR THE MONTH OF JUNE

| <u>PROVIDER</u> | <u>TREATMENT CODES / WEIGHTED VALUES</u> | | | | | | | | | |
|-----------------|--|------|------|------|------|-----|------|------|------|-------|
| | 0001 | | 0002 | | 9918 | | 9923 | | 9972 | |
| 112 | 1/ | 2.0 | 0/ | 0.0 | 0/ | 0.0 | 0/ | 0.0 | 7/ | 5.6 |
| 113 | 0/ | 0.0 | 0/ | 0.0 | 9/ | 4.5 | 14/ | 11.2 | 114/ | 91.2 |
| 114 | 0/ | 0.0 | 0/ | 0.0 | 5/ | 2.5 | 4/ | 3.2 | 60/ | 48.0 |
| 117 | 0/ | 0.0 | 0/ | 0.0 | 5/ | 2.5 | 9/ | 7.2 | 87/ | 69.6 |
| 119 | 0/ | 0.0 | 0/ | 0.0 | 3/ | 1.5 | 9/ | 7.2 | 31/ | 24.8 |
| 126 | 1/ | 2.0 | 0/ | 0.0 | 4/ | 2.0 | 0/ | 0.0 | 29/ | 23.2 |
| 131 | 0/ | 0.0 | 0/ | 0.0 | 0/ | 0.0 | 0/ | 0.0 | 113/ | 90.4 |
| 132 | 0/ | 0.0 | 0/ | 0.0 | 0/ | 0.0 | 0/ | 0.0 | 148/ | 118.4 |
| 133 | 34/ | 68.0 | 7/ | 28.0 | 0/ | 0.0 | 0/ | 0.0 | 0/ | 0.0 |
| 425 | 0/ | 0.0 | 0/ | 0.0 | 17/ | 8.5 | 0/ | 0.0 | 0/ | 0.0 |

APPENDIX I

NAVMED FORM 6600/11

The document presented on the following two pages is an
excerpt from NAVMEDCOMINST 6600 1B

**DENTAL INFORMATION RETRIEVAL SYSTEM
INDIVIDUAL DAILY TREATMENT RECORD**

**DENTAL INFORMATION
RETRIEVAL SYSTEM
INDIVIDUAL DAILY
TREATMENT RECORD**

NAVMECOMINST 0600.1

| TIME | PATIENT'S NAME AND SSN OR FUNCTION* | RANK BEN CAT | TREATMENT | CLASS |
|---------------|--|------------------|---|-------|
| 0730/ 0825 | BUI, GUSTER 155-23-8976 | BM3 (01) | #15 MOL AM, BASE, R.D., OHI, ANES | 1 |
| 0830/ 0855 | LIANUS, ROBERT 236-85-9990 | MAJ (05) | PERIO SCL AND ROOT PLANE x 2 SEXTANTS, OHI, ANES x 2 | 2 |
| 0900/ 0925 | RUSSELL, CRAIG 467-98-0105 | CAPT/ RET(11) | PRO, SCL x 2 SEXTANTS, OHI, SNF2 | |
| 0930/ 1025 | NEWMAN, GUY 335-89-4736 | O/S (13) | #3 DF AM, R.D., SNF2, ANES | |
| 1030/ 1125 | BROWN, GRACE 163-52-2019 | LT (01) | T-2 EXAM, PLAQUE INDEX, OHI, PERIO SCL AND ROOT PLANE x 1 SEXTANT, PHOTO, BP | 3 |
| 1130/ 1230 | INSERVICE TRAINING "CODE BLUE" | | | |
| 1230/ 1330 | LUNCH | | | |
| 1330/ 1405 | LOW, HENRY 241-66-9009 | HM1 (01) | ENDO INT TX, PA, R.D., TEMP | 3 |
| 1415/ 1530 | HOUSEHOLDER, JIM 354-00-8997 | PN2 (01) | T-3 EXAM, PANO, #16 IMP EXT, ANES x 2, RX x 2, BP x 2 | 3 |
| 1530/ 1630 | CREDENTIALING COMMITTEE MEETING | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| DATE | NAME AND GRADE | SIGNATURE | | |
| 12JUN86 | O. L. MISS, CAPT, DC, USN | O. L. Miss | | |

| UIC 38677 | | FACILITY NDC OXFORD | | | | | | | | |
|--|----------------------|------------------------|--------------------|--|--|--|--|--|--|-------|
| TREATMENT CODE | BENEFICIARY CATEGORY | | | | | | | | | TOTAL |
| | 01 | 05 | 11 | 15 | | | | | | |
| 0120 | 1 | | | | | | | | | |
| 0133 | 1 | | | | | | | | | |
| 0160 | 3 | | | | | | | | | |
| 0220 | 1 | | | | | | | | | |
| 0330 | 1 | | | | | | | | | |
| 0360 | 1 | | | | | | | | | |
| 1110 | | | 1 | | | | | | | |
| 1240 | | | 1 | 1 | | | | | | |
| 1330 | 2 | 1 | 1 | | | | | | | |
| 1360 | 1 | | | | | | | | | |
| 2150 | | | | 1 | | | | | | |
| 2160 | 1 | | | | | | | | | |
| 2940 | 1 | | | | | | | | | |
| 2954 | 1 | | | | | | | | | |
| 2960 | 2 | | | 1 | | | | | | |
| 3360 | 1 | | | | | | | | | |
| 4342 | | | 2 | | | | | | | |
| 4343 | 1 | 2 | | | | | | | | |
| 7130 | 1 | | | | | | | | | |
| 9211 | 4 | 2 | | 1 | | | | | | |
| 9651 | 2 | | | | | | | | | |
| 9973 | 4 | 1 | 1 | 1 | | | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | |
| Work Hours Not Available for Dental Treatment. | | | | | | | | | | |
| COLLATERAL DUTIES | LEAVE/ ILLNESS | OPERATIONAL SUPPORT | OTHER FUNCTIONS | WORK HOURS AVAILABLE FOR DENTAL TREATMENT | | | | | | |
| | | | | | | | | | | |

APPENDIX J

NAVMED FORM 6600/8

The document presented on the following page is an excerpt
from NAVMEDCOMINST 6600.1B

APPENDIX K
DENTAL INFORMATION RETRIEVAL SYSTEM

DIRS

USER'S MANUAL

TABLE OF CONTENTS

| | | |
|---------------------|-------------------------------------|----------------|
| SECTION I. | INTRODUCTION | Page(s) |
| 1. | Purpose of the User's Manual | 114 |
| 2. | Project Reference | 114 |
| 3. | Security and Privacy | 114 |
| 4. | System Overview | 114 |
| 5. | System Responsibility | 114 |
| 6. | System Configuration | 115 |
| 7. | Hardware Requirements | 115 |
| | | |
| SECTION II. | SYSTEM INSTALLATION | |
| 1. | DIRS installation | 115 |
| 2. | Loading Command Information File | 115-7 |
| 3. | Command Information File Correction | 117 |
| 4. | Loading Essential Files | 117 |
| | | |
| SECTION III. | OPERATION PROCEDURES | |
| 1. | Start-up Procedures | 117 |
| 2. | Operating Procedures | 117 |
| | | |
| SECTION IV. | MAIN MENU & SUB MENUS | |
| 1. | Main Menu | 120 |
| 2. | Input Dirs Data | 120-26 |
| 3. | Change DIRS Codes | 126 |
| 4. | Update Provider Codes | 126-27 |
| 5. | Reports Menu | 128 |
| 6. | Files Utilities | 128-30 |
| 7. | Headquarters only | 131-33 |
| 8. | Quit | 133 |

SECTION I. INTRODUCTION

1. PURPOSE OF THE USER'S MANUAL

The purpose of this User's Guide is to provide guidelines for personnel using this Dental Information Retrieval System (DIRS) program. This user's manual should answer most questions concerning the operation of DIRS. Please take time to read this manual carefully. Reading the manual before installation may save you a lot of frustration and time later on.

2. PROJECT REFERENCES

This guide is divided into sections, depending on the operation being performed. Material is presented in a step by step fashion. It is designed to provide timely reference to aid in resolving most problems that may occur while using DIRS.

3. SECURITY AND PRIVACY

The DIRS system's databases are unclassified; therefore no security clearance is required to gain access. However, be informed that each command must have an Automatic Data Processing Security Plan (ADPSP). It may be advisable to secure all spaces that contain Personal Computers (PC). Securing PCs also means protecting data from unauthorized personnel that could willingly or accidentally destroy data stored on PC.

4. SYSTEM OVERVIEW

The DIRS system is designed to gather accurate information in a relatively quick time frame. It will replace the slow and tedious manual process of producing the monthly DIRS report. The system will also maintain production data on dental officers providing dental services, and other support staff. The DIRS system is a menu-driven data base system prepared as a graduate level thesis project by two students at the Naval Postgraduate School, Monterey, Ca. DIRS is designed so that even non-computer personnel should be able to operate the system without too much difficulty (reading the user's manual will help).

5. SYSTEM RESPONSIBILITY

The Dental Department has custody of the DIRS system and will ensure that all files are properly maintained and kept current. The use of this system is restricted to personnel who are trained on the IBM PCs (or compatibles) in accordance with current instructions and those specifically authorized in writing by the Head, Dental Department. Furthermore, program modification shall be the responsibility of custodial command.

6. SYSTEM CONFIGURATION

The DIRS system is simple to use and does not require complicated ADP equipment. The system's command files are compiled; meaning, dBASE III PLUS does not have to be installed on your PC. It is designed to work on any IBM compatible PC. Reports are produced using a near-letter quality printer, except for the DIRS reports that headquarters produce. An OCR scanner is used to read the DIRS report after it is printed; therefore, an OCR printhead must be used. It is a requirement that the printer will accept this type of printhead. The DIRS system will prompt the user to switch to the OCR (auxiliary) printer when calling the monthly DIRS Report. Remember to switch back to your primary printer after completing your OCR report.

7. HARDWARE REQUIREMENTS

- a. IBM-PC compatible computer w/640K memory.
- b. 20 megabyte hard disk.
- c. MS-DOS version 3.0 or higher.
- d. An OCR 10 pitch daisy wheel printer.

SECTION II. SYSTEM INSTALLATION

1. DIRS INSTALLATION.

Insert disk #1 in drive A:.. From the root directory, at the C: drive DOS prompt, type "A:install." The install program will prompt the user for a directory name where DIRS is to be installed. Enter up to ten characters. The install program will create a directory and copy the necessary files to that directory. The install program will then ask the user to insert floppy #2 in drive a:, please do so at that time. When installation is completed, a message will appear on screen indicating that installation is complete. Notice that you are in the newly created directory where DIRS has been installed.

2. LOADING COMMAND INFORMATION FILE

To run DIRS, type "DIRS" in the directory where DIRS has been installed. Several screens will appear prompting the user for vital system and command information. The screens presented below are similar to those that the user will see.

As you are operating the program, you will be directed by the 'COMMAND NAME' and 'SYSTEM NAME' prompts to enter the name of your command and title your DIRS. We recommend that you title the system 'DENTAL INFORMATION RETRIEVAL SYSTEM' since that is the function of the system. Keep in mind that

fields A and B are used to title the upper left corner of all the menus presented in DIRS. See Figure (1) for an example of screen heading (upper left corner). In a sense, you, the user are actually customizing the system to fit your personal taste and requirements. Field C is simply a prompt requesting the number of clinics that will be supported by your command. For example, if you are a branch clinic, ship, or a stand-alone independent clinic, enter one. On the other hand, a headquarters command which will be requesting information from its subordinate clinics should enter the number of subordinate clinics and itself as the correct number to be supported.

If an error as been made in the data entered, field D will allow the user to reenter the data by entering an 'N' (No), in that field. Answering 'Y' (Yes), will generate another screen prompting you with fields (E-G). Enter your command Unit Identification Code (UIC) in Fields E. Note that field E will only tolerate numeric values to be entered. Leave a space then insert a dash (-) followed by another space before entering the official command name. It is important that the official command be entered correctly since what you input in this field is the exact data to be output on several reports generated by DIRS. Fields F&G are the UCA codes presently associated with your DIRS reporting procedure. Again the system will prompt to see if data is correct. Answering 'N' (No) to this prompt will allow correction to be made. Note that it does not matter whether your data is entered in upper or lower case, DIRS will default to upper case.

(Initial setup screen #1)

"The following information should only be entered once. DIRS will remember the information that you are about to enter. If unsure of what you must enter, see the user's manual. PLEASE ANSWER THE FOLLOWING:"

COMMAND NAME: (Field A)
SYSTEM NAME: (Field B)

"HOW MANY CLINICS WILL DIRS BE SUPPORTING (1-9):" (Field C)

"DATA CORRECT (Y/N)?" (Field D)

(Initial setup screen #2)

UCA CODES

| | | |
|---------------------------------|--------------------------|----------------|
| | | LAB - CLINICAL |
| UIC - CLINIC NAME | DIRS CODE | <0097 - 0096> |
| Example: 55555 - PORT NEVERSAIL | | CCYA CAYA |
| ENTER UIC: (Field E) | UCA CODE: (Fields F & G) | |

"DATA CORRECT (Y/N)?" (Field D)

3. COMMAND INFORMATION FILE CORRECTION

Ok, so you followed all the instructions and still managed to enter incorrect information. The main menu is displayed and you don't like the system title block. To change the information specified in section II, paragraph 2, exit DIRS by selecting "QUIT" from the main menu. You should now be at the C: prompt in the directory where dirs has been installed. Type "DEL COMM.MEM" then type "DIRS." The RAM (Random Access Memory file) will be deleted allowing you to recreate this RAM resident file as per directions stated in section II, paragraph 2.

4. LOADING ESSENTIAL FILES

Before any daily input can be entered, provider information must be entered. After all, how can one record treatment procedures on a provider without a provider? The provider file must be completed before any data can be entered. It is recommended that a range of valid provider codes be assigned to each department or clinic. It is also suggested that ranges have some type of meaningful relationship to a particular clinic or UIC, i.e.: 100-200 would be providers from clinic A, 201-300 would be providers from clinic B, and so on. Another suggestion is to end the provider code with an odd or even configuration. For example, 105 would represent a two-week active duty reservist. 100 would represent a full-time provider. Section III provides instructions on how to add, edit, or delete a provider.

The Dirs treatment database has already been completed with the most common codes used. This database may be updated if need be, by following the instructions in section III.

SECTION III. OPERATION PROCEDURES

1. START-UP PROCEDURES

The start-up procedure is designed for those with absolutely no computer background. Those of you with basic "DOS" and PC knowledge may choose to overlook this brief paragraph.

Turn on your computer. Now that your computer is on, check to see if your peripheral devices are on (printers, power director, display terminal, etc.). When everything is turned on, change directories to the directory that contains DIRS. This can be achieved by typing "CD\directory name" where "directory name" is the name that you have selected to label your directory. Now type "DIRS," this command will bring up the main menu or the memory screen discussed in Section II, if it has not already been loaded.

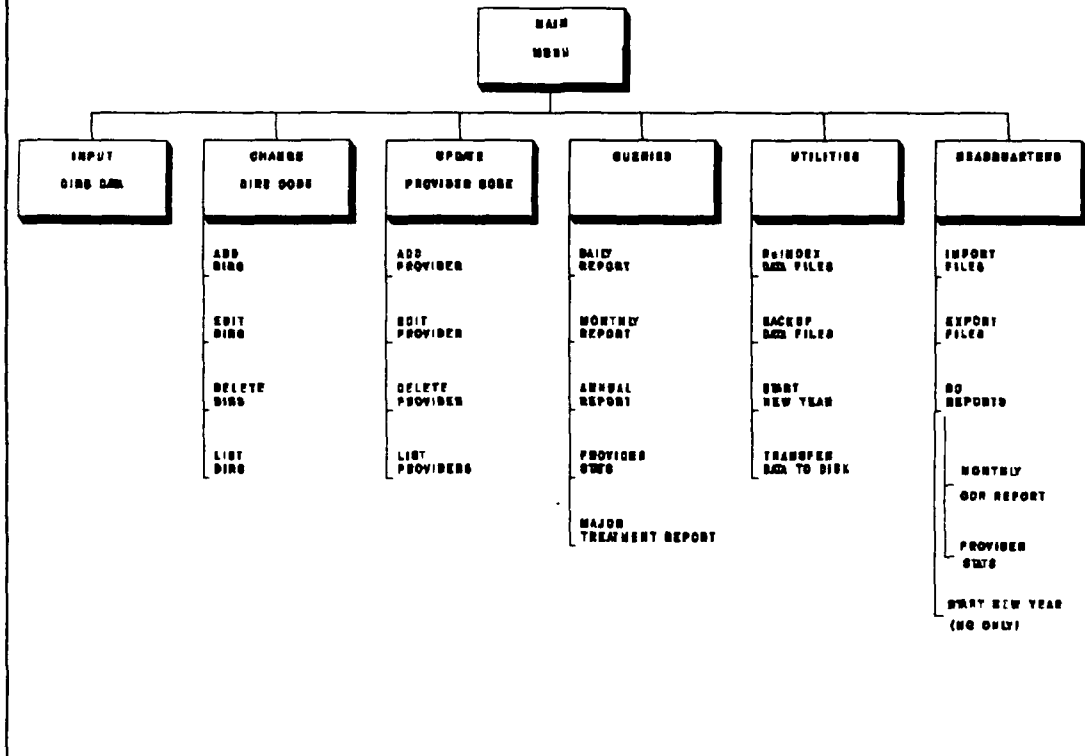
2. OPERATION PROCEDURES

Using this system is simply a matter of doing what the computer tells you to do. Your DIRS system is fully menu driven. Menu driven means that you can select any option from the menu by simply moving the arrows (↑↓) until you have highlighted your desired selection. You can also select an option by pressing the first letter of the desired option, but in the event that two menu items start with the same letter, the system will default to the first selection. The most complicated thing about this system is getting over the phobia generally associated with computers. Remember to relax and read what the computer is prompting you to do. Reading prompts (the messages that the system displays when it wants you to do something) is generally the key to success when using any menu driven system.

SECTION IV. MAIN MENU AND SUB MENU.

The diagram provided on the next page titled; "Menu Hierarchy," should provide a helpful overview of the various menu screens available in DIRS should you get lost in a particular level or just want a ready reference to a destination or operation of choice. You may find it helpful to enlarge the diagram and post it in a convenient location until you gain familiarity with the system.

MENU HIERARCHY



1. THE MAIN MENU
Heading

| | | |
|-----------|---|-----------------------------------|
| A | NAVAL DENTAL CLINIC, USN DENTAL INFORMATION RETRIEVAL SYSTEM | 13:17:17 01/13/90 SCREEN # 1.0 |
| ----- | | |
| MAIN MENU | | |
| B | INPUT DIRS DATA CHANGE DIRS CODES UPDATE PROVIDER CODES QUERIES FILE UTILITIES HEADQUARTERS ONLY QUIT | |
| ----- | | |
| C | USE UP AND DOWN CURSOR KEYS ↑↓ TO HIGHLIGHT ITEM AND PRESS<RETURN> | |

Prompt & Status Box

Figure 1. Main Menu Screen

To operate the DIRS system, enter the first letter which corresponds to the item in the menu body that you want to select, or move the arrow keys (↑↓) to highlight your choice. All menus have a RETURN option to return to the calling Menu. Note that the heading section of the menu above, displays the command name and system title that you have selected and entered at initial installation. The upper right corner of the menu displays such information as current date, time, and screen number. All menus within DIRS support this type of display. The body or middle of the screen displays options available. The option may be selected as per stated in the bottom section of the screen. This bottom section is the area that the user should pay particular attention to, since error messages and/or user prompts will be displayed there. The system will also beep when invalid or incorrect data has been input.

2. INPUT DIRS DATA

The first screen that will appear when selecting option one (INPUT DIRS DATA) is displayed below (Figure 2). Enter "Y" (yes), if the displayed month is the desired month for data entry. Enter "N" (no) to select another month. When "N" is selected a window will appear displaying options that may be keyed in at the prompt (see Figure 3). The default month (open month on screen) is the current calendar month

month (open month on screen) is the current calendar month based on the computers system clock.

| | | |
|-------------------------------------|----------|----------|
| NAVAL DENTAL CLINIC, USN | 08:05:14 | 01/13/90 |
| DENTAL INFORMATION RETRIEVAL SYSTEM | SCREEN # | 1.1.1 |
| ----- | | |
| OPEN MONTH IS JANUARY | | |
| ----- | | |
| IS THIS CORRECT? Y/N | | |

Figure 2. Input DIRS Data (Open Month Confirmation)

| | | |
|---|----------|----------|
| NAVAL DENTAL CLINIC, USN | 09:02:20 | 01/13/90 |
| DENTAL INFORMATION RETRIEVAL SYSTEM | SCREEN # | 1.1.1 |
| ----- | | |
| JAN | JUL | |
| FEB | AUG | |
| MAR | SEP | |
| APR | OCT | |
| MAY | NOV | |
| JUN | DEC | |
| ----- | | |
| ENTER THREE LETTERS OF NEW MONTH: _____ | | |

Figure 3. Month Input Screen

To select the correct month, the three letter abbreviation is entered at the prompt. For example, typing JUN in the month selection screen will the month of June for data entry. Once the desired month has been opened, the provider prompt screen will follow.

To select a provider, the provider code may be entered directly if the code is known, or by pressing the <HOME> key, an additional window with the valid provider codes assigned to the reporting command will pop up. From the available valid provider codes on screen, the corresponding number that matches the desired provider code may be entered. (See Figures (4) & (5)).

```

NAVAL DENTAL CLINIC, USN          08:18:58  01/13/90
DENTAL INFORMATION RETRIEVAL SYSTEM SCREEN # 1.1.1
-----

```

PROVIDER CODE:

ENTER PROVIDER CODE OR PRESS <HOME> FOR HELP

Figure 4. Provider Code Entry Screen

```

NAVAL DENTAL CLINIC, USN          08:18:58  01/13/90
DENTAL INFORMATION RETRIEVAL SYSTEM SCREEN # 1.1.1
-----

```

| | PROVIDER CODE | RANK | NAME |
|----|---------------|------|------------------|
| 1. | 100 | CDR | NAVY, JOSEPH |
| 2. | 200 | LT | NAVY, SON |
| 3. | 300 | LT | MESIAL, DECAY |
| 4. | 400 | CAPT | TOOTH, DECAY |
| 5. | 455 | LT | RESERVE, DENTIST |
| 6. | 500 | CDR | BUCKLE, PIT |
| 7. | 600 | LT | LINGUAL, DISTAL |
| 8. | 700 | ADM | DENTAL, SERVICE |

PRESS NUMBER OF ITEM, RETURN TO CONTINUE, OR "Q" TO QUIT

Figure 5. Provider Codes Screen

To select a valid provider, enter the matching number in the leftmost column, i.e.: entering number "1" would select provider 100; CDR Navy. The provider code may also be entered directly on the provider input screen. This method of provider data entry provides a method to check the provider code file to validate a correct provider code for the reporting unit. Entering an erroneous code (a code not currently in the provider code file) results in an error message indicating that fact, and further prompts the user to enter another code. When the provider field is correctly entered, the screen displayed in Figure 6 will follow, prompting the user to enter a valid treatment code. As previously discussed, to escape the DIRS entry routine, press <RETURN> at a blank DIRS field. The "ESC" key provides another escape route by allowing the user to select the

another escape route by allowing the user to select the cancel option that will pop-up in the upper left corner of the screen. This escape feature will return the user completely back to the DOS C: prompt.

```
NAVAL DENTAL CLINIC, USN                                08:05:14   01/13/90  
DENTAL INFORMATION RETRIEVAL SYSTEM                     SCREEN # 1.1.2
```

```
Entering Data for Provider: CDR JOSEPH NAVY    CODE: 100
```

```
PRESS THE <HOME> KEY FOR A LIST OF DIRS CODES TO  
SELECT FROM.
```

```
PRESS <RETURN> ON AN EMPTY FIELD TO RETURN TO THE  
MAIN MENU.
```

```
ENTER DIRS CODE:
```

Figure 6. DIRS Treatment Code Entry Screen

Pressing the <HOME> key will display all valid DIRS codes such as presented in Figure 7.

| | | | |
|--|-----------------|----------|----------|
| NAVAL DENTAL CLINIC, USN | | 08:05:14 | 01/13/90 |
| DENTAL INFORMATION RETRIEVAL SYSTEM | | SCREEN # | 1.1.2 |
| ----- | | | |
| DIRS CODE | DESCRIPTION | WEIGHT | |
| 1. 0001 | POUR CAST | 2.0 | |
| 2. 0002 | POUR CAST, FX | 4.0 | |
| 3. 0003 | BOX AND POUR | 5.0 | |
| 4. 0004 | IMP TRAY CUS | 4.0 | |
| 5. 0005 | POUR ALT CAS | 5.0 | |
| 6. 0006 | ARTIC. SIMPL | 1.0 | |
| 7. 0007 | ARTIC. SEMI | 1.5 | |
| 8. 0008 | ARTIC. FULL | 2.0 | |
| 9. 0009 | SOLDER/PER AREA | 4.0 | |
| ----- | | | |
| PRESS NUMBER OF ITEM, RETURN TO CONTINUE, OR "Q" TO QUIT | | | |

Figure 7. DIRS Treatment Codes

The DIRS treatment code may also be entered directly on the DIRS prompt screen or the <HOME> key may be used to assist the user in the event that the correct DIRS code is unknown. This help function is not a mandatory input procedure, if you know the correct code, entering it directly will save time.

To select a DIRS treatment code, the corresponding number displayed in the leftmost column is selected by typing the appropriate number ("1"- "9"). Pressing the <Page Down> or <Page Up> keys will scroll through the list to display other treatment codes.

After a valid provider and treatment code have been selected the following screen (Figure 8) will appear:

| | | | |
|--|----------------------|-------------------|-----------------|
| NAVAL DENTAL CLINIC, USN | | 12:04:39 | 01/13/90 |
| DENTAL INFORMATION RETRIEVAL SYSTEM | | SCREEN # 1.1.3 | |
| ----- | | | |
| Entering Data for Provider: TEST TEST TEST | | CODE: | 100 |
| DIRS Code: 0120 | | | |
| Beneficiaries | Additions to File | Totals in File | Year to Date |
| Category 1 | 0 | 0 | 0 |
| Category 2 | 0 | 0 | 0 |
| Category 5 | 0 | 0 | 0 |
| Category 8 | 0 | 0 | 0 |
| Category 9 | 0 | 0 | 0 |
| Category 10 | 0 | 0 | 0 |
| Category 11 | 0 | 0 | 0 |
| Category 12 | 0 | 0 | 0 |
| Category 13 | 0 | 0 | 0 |
| ----- | | | |
| ENTER NEW VALUES AND PRESS RETURN | | | |

Figure 8. DIRS Data Entry Screen

Data entry for an individual provider is accomplished using screen 1.1.3, (depicted in Figure 8) by entering the correct quantity of procedures completed in each dental beneficiary category. A listing with a brief definition of each beneficiary category code is provided in the diagram on the next page.

The <RETURN> key is used to move the cursor to the next field for data entry. The steps listed above are repeated until the user has completed data entry for a particular provider. Data entry error corrections are accomplished in

BENEFICIARY CODES:

- 01 - Active Duty, U.S. Navy**
- 02 - Active Duty, U.S. Marine Corps**
- 05 - Active Duty, Other Services**
- 08 - Recruit, U.S. Navy or Marine Corps**
- 09 - Dependents of Active Duty
U.S. Uniformed Services Personnel**
- 10 - Dependents of Retired or Deceased
U.S. Uniformed Services Personnel**
- 11 - Retired Uniformed Services Personnel**
- 12 - Other Personnel not listed in Codes
01 through 11 and 13**
- 13 - Dependent Children,
(17 & under and unmarried)**

a number of ways. The user is prompted with the following query at the bottom of screen 1.1.3; "Is this data correct? Y/N". A negative response indicated by typing the "N" key, will allow the user to reenter the correct data. The user may overwrite the data displayed on screen by moving the cursor using the arrow keys to the correct field and reentering the correct quantity. Deletion and editing of values previously entered for a particular month is accomplished by selecting the desired month, provider, and treatment, and entering an appropriate negative value to either cancel or modify the monthly total for the selected record.

To return to the main menu, the <RETURN> key is pressed with the cursor on a blank DIRS input field or typing "Q" when prompted from the help screen.

When a month and provider have been selected, the user may continue adding new treatment data without returning to the main menu for each instance. To enter data for another provider, the user must return to the main menu and select the desired month and treatments. The system will default to the month of last data entry. Upon termination of a data entry session, a final query will prompt the user with the following message; "Do you wish to save this data? Y/N." Selecting "N" will not save the data entered during the session. This particular feature provides a control mechanism, allowing the user to correct or terminate a data

entry session without arbitrary input of inadequately screened or inaccurate data to the database. Selecting "Y" will automatically result in appropriate updates to the Daily, Monthly, and Yearly files. Selection of "Y" will also result in the display of the following messages in the status box located at the bottom of the screen; "Adding to Monthly Total" and "Adding to Yearly Total," informing the system user of action in progress.

3. Change DIRS Codes

Selection 2 from the main menu should be selected when you wish to add, delete, edit, or list your DIRS (treatment) codes (Figure 9). Deleting means erasing of an existing code. Editing means changing an existing code. Please note that though some of the most common DIRS treatment codes have already been entered, this does not mean that all the codes that your clinic uses have been entered. When calling these functions, the system works in the same manner as the DIRS entry section except that a month does not have to be opened.

| | | |
|--|----------|----------|
| NAVAL DENTAL CLINIC, USN | 12:47:51 | 01/13/90 |
| DENTAL INFORMATION RETRIEVAL SYSTEM | SCREEN # | 1.2 |
| ----- | | |
| DIRS CODES MENU | | |
| ADD CODE | | |
| EDIT CODE | | |
| DELETE CODE | | |
| LIST CODES | | |
| RETURN TO MAIN MENU | | |
| ----- | | |
| USE UP AND DOWN CURSOR KEYS ↑ ↓ TO HIGHLIGHT ITEM AND PRESS<RETURN> | | |

Figure 9. Change DIRS Codes Menu

4. Update Provider Codes

The function of the Update Provider Codes menu (Figure 10) is similar to that described above for Change DIRS Codes. In this instance, rather than the treatment codes, the update function and display function pertains to the provider at a given command. Again, the command listing of providers is provided as a convenience to the system user.

```
NAVAL DENTAL CLINIC, LONG BEACH, CA.    12:47:51  01/13/90
DENTAL INFORMATION RETRIEVAL SYSTEM      SCREEN # 1.3
```

```
PROVIDERS CODE MENU
  ADD CODE
  EDIT CODE
  DELETE CODE
  LIST CODES
  RETURN TO MAIN MENU
```

```
USE UP AND DOWN CURSOR KEYS ↑↓ TO HIGHLIGHT ITEM AND
PRESS<RETURN>
```

Figure 10. Update Provider Codes Menu

```
NAVAL DENTAL CLINIC, USN                3:18:52  11/10/89
DENTAL INFORMATION RETRIEVAL SYSTEM      SCREEN # 1.3.2
```

```
PROVIDER CODE: 100
LAST NAME:      NAVY
FIRST NAME:     NAVY
RANK:           CDR    STATUS: O
                        ENTER (R) = Reserve
                        (C) = Contract
                        (O) = Other <Return>
```

```
ENTER CORRECT PROVIDER INFORMATION
```

Figure 11. Provider Code Data Entry Screen

Note the upper left corner of Figure 11. The screen number is now SCREEN #1.3.2. The two means that you are now in the edit module under option three (UPDATE PROVIDER CODES). All screen within this system provide such information. Figure 11 shows a prompt labelled "status." You can enter one of three things here as stated on the screen. When entering "R" you are telling the system that the provider is a reservist. "C" implies that the provider is contracted personnel and "O" is all other personnel. Whether selecting add, edit, or delete, the screen depicted in Figure 12 will be used.

5. Report Menu

The Report menu (Figure 12) presents the user with a number of options related to reporting of DIRS data by various chronological periods. Using the options available in this menu, the current total of treatments, treatments by provider, by command, etc. may be obtained. For example, the DAILY REPORT will repeat all information keyed-in via the "INPUT DIRS DATA" selection. Also note that you will be asked whether or not you would like a daily report every time you exit the system. Naturally, if no data has been entered for that day no report will be generated.

Additionally, a Major Treatment Report option is available as a menu selection for internal reporting purposes. Please note that the major report will query on up to ten user defined treatment code. Please note: you must either change the printer font size (pitch) to 17 pitch, or use wide printer paper for the report to fit with seven or more treatments. The system will forewarn you in the event that wider paper is required.

```
NAVAL DENTAL CLINIC, LONG BEACH, CA. 12:49:38 01/13/90
DENTAL INFORMATION RETRIEVAL SYSTEM  SCREEN # 1.4
-----
                                REPORT MENU

                                DAILY REPORT
                                MONTHLY REPORT
                                ANNUAL REPORT
                                PROVIDERS STATS.
                                MAJOR TREATMENT REPORT

                                RETURN TO MAIN MENU

-----
USE UP AND DOWN CURSOR KEYS ↑↓ TO HIGHLIGHT ITEM AND
PRESS<RETURN>
```

Figure 12. Branch Clinic Report Menu

6. File Utilities Menu

The menu screen presented in Figure 13 offers the system user the ability to reindex, backup, transfer, and start a new recording year all from within the DIRS application. Providing these necessary functions from within the system as menu-driven options helps simplify the normally onerous and often neglected tasks such as backing up the system data.


```
NAVAL DENTAL CLINIC, LONG BEACH, CA. 13:50:16 01/13/90
DENTAL INFORMATION RETRIEVAL SYSTEM  SCREEN # 1.5
-----
```

FILE UTILITIES

```
REINDEX DATA FILES
BACKUP DATA FILES
START NEW YEAR
TRANSFER DATA TO DISK
RETURN TO MAIN MENU
-----
```

```
USE UP AND DOWN CURSOR KEYS ↑↓ TO HIGHLIGHT ITEM AND
PRESS<RETURN>
```

Figure 13. File Utilities Menu

The reindex data files option should be selected when the system shows signs of incorrect operation such as incorrectly assigned totals or data. As an example, reports may display zero work for all providers at a specified command for a given month. If this information is incorrect, using the reindex option will reassign the appropriate key field to their respective records. The reindex feature is often required in any database system. Power surges, improper file closing and hardware malfunctions are examples of possible causal factors for index distortion. The reindex option is provided to reestablish the proper links and pointers to correct the potential damage caused by these malfunctions.

Selecting the backup data files option will store all data on floppy disks. Be aware that your diskette must be formatted before any data can be captured on disk. See your DOS manual on formatting floppies. It is strongly recommended that backups be made at least once per week. Remember PCs are mechanical in nature. Should your PC breakdown, having a current backup will save you many hours, if not days, of data reentry.

The "Start New Year" option is provided when the users wish to begin recordkeeping functions for a new reporting year; either calendar, fiscal or other arbitrary selection. Failure to select this option when starting a new reporting period will result in overwritten data values and incorrect totals for the selected period.

The "Transfer Data to Disk" option is selected to transfer data for a monthly reporting period to a "floppy disk" for subsequent export to the appropriate Headquarters command. Production of the OCR report form may only be

accomplished at the Headquarters level after import of the transfer files.

The transfer routine will transfer the working file to a floppy disk. The UIC window located in the lower right corner depicted in Figure 14, prompts the user to select a number; 1 through 5. The number "5" is representative of a Headquarters command with five subordinate DTFs. This number will reflect the actual number of DTFs supporting as few as one or as many as nine. If the system is being used at a branch clinic, only one UIC is displayed and selected. User input of the correct UIC is critical, because a UIC FIELD will be appended on the TRANS. FILE based on the UIC input. The TRANS. FILE is the database export file to be received by the corresponding Headquarters command. This routine will be selected when a subordinate DTF is required to submit data to headquarters. Regardless of transmission medium, the export routine must be selected to transfer all data to floppy disk, prior to submission of the updated monthly data requirements. The export procedure described above provides a necessary if subtle control mechanism ensuring that data back-ups are performed at least once a month. When properly labeled with the appropriate UIC, and month of transfer, the floppy disks containing the TRANS database file (dbf) provide a convenient source of back-up data. The menu status box (part C) will provide a prompt to insert a floppy disk into the appropriate drive, and a message indicating the number of records transferred.

| | | | |
|-------------------------------------|-------|---------------------------|----------|
| NAVAL DENTAL CLINIC, USN | | 13:51:59 | 11/10/89 |
| DENTAL INFORMATION RETRIEVAL SYSTEM | | SCREEN # 1.5.4 | |
| ----- | | | |
| ENTER UIC: | | | |
| ENTER MONTH OF REPORT: | | | |
| | i.e.: | | |
| | | *** VALID UIC *** | |
| | | 1) 00000 - HQ & NOWHERE | |
| | | 2) 55555 - PORT NEVERSAIL | |
| | | 3) 55511 - POINT HERE | |
| | | 4) 51515 - CHINA | |
| | | 5) 99999 - C O BEACH | |
| | | 0) RETURN TO MAIN MENU | |
| | | SELECT (0 - 5)? 0 | |

Figure 14. File Transfer Screen

7. Headquarters Menu

The Headquarters menu (Figure 15) is intended for the Headquarters command to facilitate the transfer of DIRS data from subordinate dental commands, and the obligatory submission of DIRS reports. To that end, file import/export facilities are provided as menu options for operation from within the DIRS application.

| | | |
|---|--------------|----------|
| NAVAL DENTAL CLINIC, LONG BEACH, CA. | 13:53:44 | 01/13/90 |
| DENTAL INFORMATION RETRIEVAL SYSTEM | SCREEN # 1.6 | |
| ----- | | |
| HEADQUARTER'S MENU | | |
| IMPORT FILES | | |
| EXPORT FILES | | |
| DO REPORTS | | |
| START NEW YEAR (HQ ONLY) | | |
| RETURN TO MAIN MENU | | |
| ----- | | |
| USE UP AND DOWN CURSOR KEYS ↑↓ TO HIGHLIGHT ITEM AND PRESS<RETURN> | | |

Figure 15. Headquarter's Menu

7.1. IMPORT FILES.

The "IMPORT FILES" option is provided to receive files transmitted from subordinate commands.

7.2. EXPORT FILES.

Similarly, the "EXPORT FILES" option is provided to allow a Headquarters command to send a pre-selected month of data for all of its subordinate commands.

7.3. DO REPORTS.

Selection of the "DO REPORTS" option will result in the display of the screen presented in Figure 16 with provisions for selection of either the DIRS OCR format monthly report or a "PROVIDERS STATS." internal report option.

```
NAVAL DENTAL CLINIC, LONG BEACH, CA. 13:53:44 01/13/90
DENTAL INFORMATION RETRIEVAL SYSTEM SCREEN # 1.6.2
-----
```

HEADQUARTER'S REPORTS

MONTHLY DIRS REPORT
PROVIDER STATS.
RETURN TO MAIN MENU

USE UP AND DOWN CURSOR KEYS ↑↓ TO HIGHLIGHT ITEM AND
PRESS<RETURN>

Figure 16. Headquarters Reports

A. MONTHLY DIRS REPORT

The "MONTHLY DIRS REPORT" selection option is supported by the menu screen presented in Figure 17. This selection will enable the Headquarters to print the standard monthly NAVMED 6600/8 OCR form required for submission of DIRS data to COMNAVMEDCOM using an OCR font capable printer.

```
NAVAL DENTAL CLINIC, LONG BEACH, CA. 11:50:26 11/10/89
DENTAL INFORMATION RETRIEVAL SYSTEM SCREEN # 1.5.1
-----
```

SELECT UIC: 00000

Name of Facility: SEE TABLE 1

Provider's Hours: 12.00

(1) Original --
(2) Correction | Select
(3) resubmission | (1-3)?
 --

```
*** VALID UIC ***
1) 00000 - HQ & LB CLINIC
2) 55555 - PORT NEVERSAIL
3) 55544 - POINT HERE
4) 51515 - CHINA
5) 99999 - C O BEACH

0) RETURN TO MAIN MENU

SELECT (0 - 5)? 1
```

IS DATA CORRECT (Y/N)?

Figure 17. HQ OCR DIRS SCREEN

The first step in running this procedure is selecting a UIC which represents the reporting branch clinic. Step number 2 is to enter the facility's name. Step 3 is the provider's hour field from your monthly MEPRS report. Step 4 is a selection representing the status of the report. An original report is the first submission for the reporting period. A correction is a submission to add, delete or correct data detected locally or by the OCR reader. Since corrected reports are not supposed to duplicate data, the corrected reports will have to be typed manually. Corrected reports consist of applicable changes only; (i.e., additions or deletions for specific treatment codes). A resubmission is the forwarding of one, several, or all pages to MEDCOM-633 that were not read by OCR reader. A resubmission does not have to be performed manually. The last step is a validation field asking you to enter a "Y" (yes) or "N" (no) if the data is correct. Should you enter a no, you will be asked to select a UIC, or if you so desire at this time exit this routine. When lining up the DIRS form in the OCR printer, a lot of trial and error may be necessary at first to line up the form exactly. Once lined up, it is highly recommended that you mark your printer so that next time you will know exactly where to line up the form. The ideal line-up is identified when an "L" is typed right on top of the OCR FORM "L."

B. PROVIDER STATS.

The Provider Stats option at the Headquarters level is a compilation of all subordinate DTF's Provider Stats reports. This routine is identical to the routine described for individual providers' stats. The only exception is that this report reflects the entire command. An example of the Provider Stats Report is provided in Appendix K.

C. START NEW YEAR (HQ ONLY).

The "START NEW YEAR (HQ ONLY)" option provided on the Headquarters menu is identical in function to that provided by the "START NEW YEAR" option for subordinate DTFs except that it only reinitializes the headquarter's database. As previously discussed, this option is used to initialize records to zero, providing recordkeeping functions for a new reporting year; either calendar, fiscal or other arbitrary selection.

8. QUIT.

As you probably have figured out the "Q" (QUIT) option exits your system and returns you to the DOS prompt.

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